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NOTE—Beware of Imitators—Deal with the Originals

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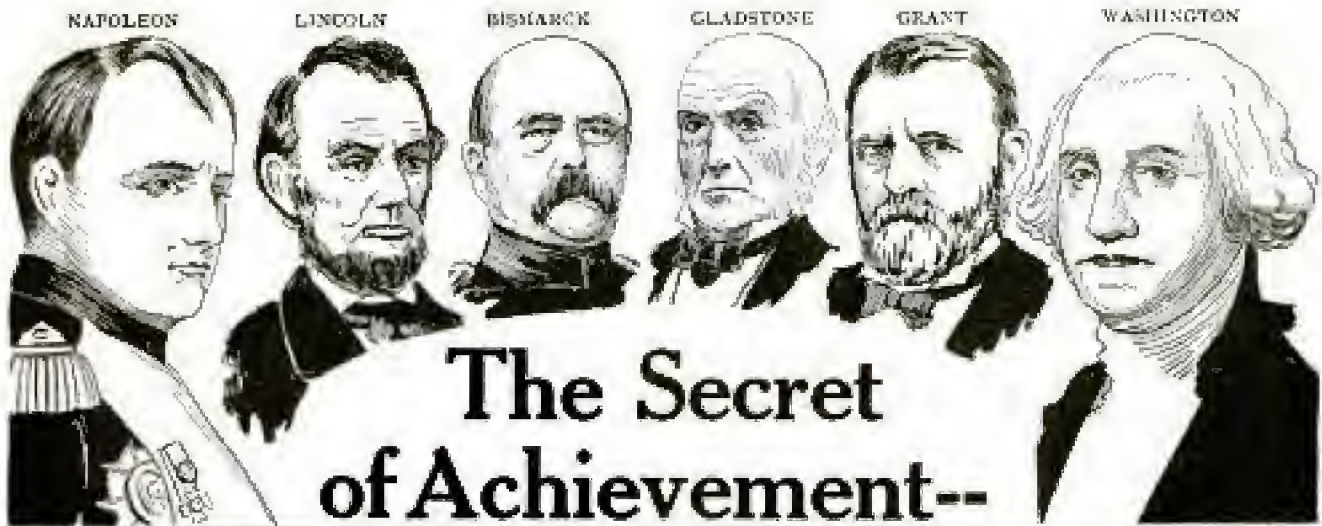


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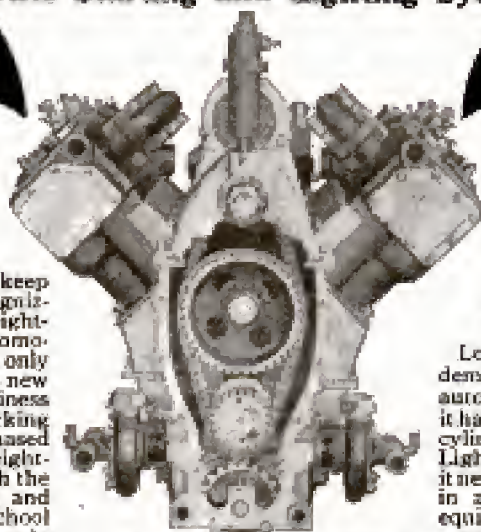
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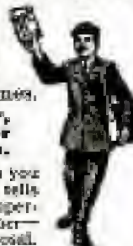
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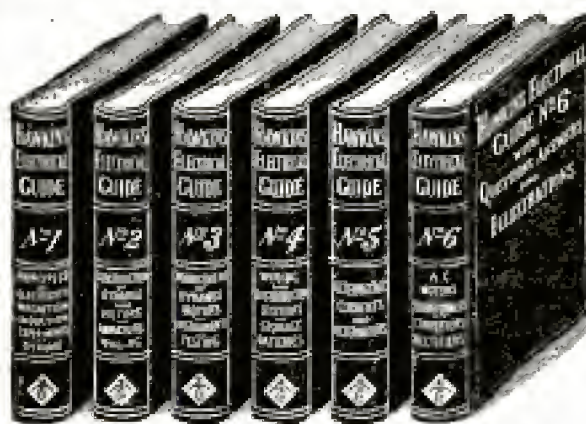
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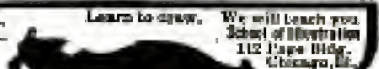
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"BUSINESS by Mail" Only real magazine that exposes the Mail Order business. 1 month 10c. 502 Mascoe Hall, Brownsville, Ky.

50 WEEKLY easy. Start cleaning, dyeing business, or learn easily making small expense, large profits, 1 1/2 to 4 cpm. Matthews, 40 East 5th North, Portland, Oregon.

FREE—Furnish big dealers dwelling 500 plans, trades, professions, schemes, for making money! Northern, 151 West Randolph, Chicago.

\$5 PER day for laborers—I know how to induce employers to share profits. Like Henry Ford of Detroit. Big quick money for you helping promote the idea by mail. Particulars 10c. T. Lohr, McKeanpost, Pa.

READ "Inventor"—make more money. Operate Mail Order business—save time. "Inventor" shows how! Special: two month trial, 10c. Inventor Magazine, Northwestern Building, Chicago.

I NEEDED Branch Managers for my world-wide mail-order business. Operate from your own home in spare time. No canvassing or peddling. Experience unnecessary. You should make \$50 weekly. Butler 181 Factories, Toledo, O.

"THE Art and Process of Dry Cleaning." A very profitable business. Send for our booklet, 25c. Auburn Supply Co., Dept. 307, 7745 Persia St., Chicago.

RESILVERING mirrors, covering dry batteries and book filled with formulas and trade secrets. All 25c. Formula Service, 3311-U, Bellgrade Ave., Chicago.

MAKE your own Typewriter-Ribbon Ink-Making Machine. Machine cost only 10c. Patent. Product sells everywhere. Large drawings and full directions. \$1. Coorsen, Box 1183, Clinton, Ont.

PATENT News, Washington, D. C. Send free sample before obtaining patent.

NEWSPAPER Classified Advertising, 80 page rate-book, 5c exact postage. Kline Advertising Agency, Cleveland, Ohio.

HOME Work—15 ways to make money at home spare-time. Also circular mailing course. No capital. All 25c. R. Sanford, 2127H Monroe, Toledo, Ohio.

I WANT to send you proof of the wonderful pulling power of Popular Mechanics classified pages. What's your proposition? Write me today. P. W. Johnson, Classified Dept., Popular Mechanics Magazine, 6 N. Michigan Ave., Chicago.

RESILVER Mirrors and make money. Others are doing it. The best formula 25c. Auburn Supply Co., Dept. 31, 7745 Persia St., Chicago.

SELL Books by mail: big profits. Send 50c for two samples and particulars. Chas. Meis, 206 East 88th St., New York.

BUILD a Paying Business of your own! I have the line you have been waiting for: particulars free. H. B. Lane, Box 201-P, Lakewood, N. J.

USE your spare time to build up a mail order business of your own. We help you start for a share in profits. 27 opportunities. Particulars free. Opportunities Exchange, Buffalo, N. Y.

MAKE Big Money Opening Sales and Selling Combinations. Wayne Strong, Box 1430, Los Angeles, Cal.

MAIL ORDER SUPPLIES

INCREASE your sales. Place your proposition before the readers of "Cartoons Magazine." 30,000 copies guaranteed every month. Classified rate 2c per word. Mail in a trial ad today. Cartoons Classified Dept., 6 N. Michigan Ave., Chicago.

PAN-AMERICAN INVESTMENTS. A. B. C. REPUBLICS, SOUTH AMERICA

CAPITALISTS desiring to invest with the view to investing in Coal, Iron, Petroleum, Nitrate or Borax deposits, etc.; Mining Properties (Copper, Tin, Silver, Gold, etc.); Real Estate (large land tracts, Government or private, all forest, grazing or agricultural), located in the "ABC" and adjoining South American Republics, are invited to write for information, enclosing 50c in stamps, to T. Deane Locking (Pan-American Real Estate Dealer), P. O. Box 3301, Santiago, Chile.

TO INDUSTRIAL ENTERPRISES, MANUFACTURERS, ETC.

GOVERNMENTAL, and Municipal Franchises solicited in the "ABC" and adjoining South American Republics, water powers, etc.; bids presented for execution of public works, supplying materials, etc.; legal and commercial representation of manufacturers, reports on establishment of industrial enterprises, ample and satisfactory references offered. Address, T. Deane Locking (Pan-American Industrial Representative), P. O. Box 3301, Santiago, Chile.

TO MANUFACTURERS

BROOM your business! Manufacturers and market a new invention. Write, stating present line of goods manufactured. Adam Fisher Mfg. Co., 1051, St. Louis, Mo.

DUPLICATORS AND DEVICES

THIS Modern Duplicator, made without glue or solating, is the World's Standard. Fifty to seventy-five exact duplicate copies can be made from each one you wish or draw with pen, pencil or typewriter. \$2.40 to \$6.00 according to size. Booklet Free. Dushin, Reeves & Co., Mfrs., 319 Fifth Ave., Pittsburgh, Pa.

FOR ADVERTISERS

START an original mail-order business. Honest, independent. Small Capital. New Methods. Sole Rights. Big Money. R. Clement Moore, Business Specialist, New Egypt, N. J.

ADVERTISE on big desk blotter. Your business always before thousands of business men. Big results. Address L. Felice Coorsen, Glenside, Pa.

10,000 BOYS read our Illustrated 16-32 page 1x10 magazine. Display for line, minimum 35c. Classified 1c word, minimum .25c. Two insertions 15% discount. Youth's Magazine, Chicago.

25-WORD advertisement in 100 magazines \$1.00. Special newspaper rates. 5c brings lists. Clem Advertising Agency, 315-32 Angel Bldg., Denver, Colo.

ADVERTISEMENTS—Special—5c per word places your ads in 173 different magazines. Send copy now. Lists free. King's Magazine, Box 13-P, Little Silver, N. J.

ADVERTISING in Barkley's Magazine, 1c word. Barkley's Magazine, 466 Hadesville, Pennsylvania.

ADVERTISEMENTS—Here's your opportunity. Your proposition placed before the readers of "Cartoons Magazine" for only 2c per word. Circulation 30,000 copies guaranteed. Send a trial ad for our next issue. Cartoons Classified Dept., 6 N. Michigan Ave., Chicago, Ill.

YOUR 30-word ad in our big postcard magazine, 25c. Display, 50c each. ELLS Exchange, 3837 N. Kenneth, Chicago.

ADVERTISING SERVICE

BOOKLETS written to advertise your product. Outline of sales argument and price of booklet quoted free on receipt of circular or description of product. Warren Edwards, Latton Building, Chicago.

PERSONAL

BROTHER—Accidentally discovered root cures tobacco habit. Gladly send particulars. F. Stokes, Mankok, Florida.

"QUIT Tobacco" my harmless way. Quick—Secret—Pleasant—Inexpensive. Increasing Booklet Free. J. Bradford, Asheville, N. C.

AGENTS WANTED

EUROPEAN War Books: everybody wants them; the best sellers now; leading agents' proposition; 100% profit; can sell 50 books in few hours. Quilt free. Marcello, Birmingham, New York.

YOUNG Man, would you accept and wear a fine tailor-made suit just for showing it to your friends? Or a Slip-on Raincoat free? Could you use \$3 a day for a little spare time? Perhaps we can offer you a steady job? If you live in a town smaller than 10,000, write at once and get beautiful samples, styles and this wonderful offer. Banner Tailoring Co., Dept. 934, Chicago.

OUR national advertising helps you sell Fuller Sanitary Brushes and Double Mops and Dusters—full line—easy sellers. We tell you how. Biggest factory for twisted wire brushes in U. S.—reliable, strong concern. Your territory is valuable. Write at once. Fuller Brush Co., 33 Bradley Place, Hartford, Conn. Western Branch, Rock Island, Ill.

WE manufacture the largest line of Aluminum Utensils and Specialties in the world. Sales course free. \$10 a week easy to handle. Answer quick. American Aluminum Mfg. Co., Inc. P. M., Lemont, Ill.

AGENTS—Average \$5 to \$12 daily selling astonishing Adee massage machine. New. Just patented. Different. No electricity or water power required. Nothing complicated. Affords exhilarating massage without cost expense. Lowest priced, best built outfit. Retail \$2.50 allowing you 50c out of the profit. Particulars and "Beauty" folder free. Adee Remedy Co., Dept. 132, Toledo, Ohio.

BIG Profits for You! Manufacture Harley, Crisp, New Comforter. 5c package costs you 1c. Machine, instructions complete \$7.50 prepaid. Send 10c for samples. Harley Crisp Co., 1205 Broadway, San Francisco.

AGENTS—Sell rich-looking Imported 25x35 Buss, 11 each. Carter, Tenn., sold 115 in 4 days. Profit \$51. You can do same. Write for sample offer selling plan; exclusive territory. Sample ring by parcel post prepaid, 38c. Condon, Importer, Stonington, Maine.

YOU can make big profits selling our Order Getting Line of Guaranteed Goods. \$200,000 Item and Liberal Credit Plan backs you. Valuable Premiums for you and for your customers. Wm. J. Dick, Mgr., Dept. R-21, 20 W. Lake St., Chicago.

AGENTS—Drop dead once. Awake! Grab this new invention. Low-priced, war-repower home message machine. Magical, marvellous, mysterious. New field. Big profits. Sold on money-back guarantee. "Marguerite" sold 5 in 10 minutes; 31 in 2 days. "Parker" sells 3 first day. "Vaughn," "your machine has merit. Express it down." Free information, Blackstone Co., 375 Meredith, Toledo, O.

OFFER Free to Agents. Best selling Handkerchiefs, Dress Goods and Fancy Goods on the market. Quick sellers, big profits. Deal direct with a large manufacturer. Send stamp for particulars. Freeman Mfg. Co., 58 Main St., Brooklyn, New York.

50% PROFIT selling our wonderful sign letters for office windows, store fronts and glass signs; resembling finest gold leaf; easily applied; samples free. Metallic Letter Co., 404 N. Clark St., Chicago.

AGENTS—Graham's Self-Centered Socks. Patented. Price no higher. Guaranteed never wear down. Fine gauge, wear forever quality. Big sellers. Send 15c for samples. State also. Graham Company, 336-P, Forest Ave., Oak Park, Ill.

STOP Here! Let me start you in a home business that will bring you money every day. Experience unnecessary. Spare time. No canvassing. I furnish everything. Send for profits. Voorhes, Desk C. R., Omaha, Neb.

AGENTS—Stamping names on Pocket Key Protectors; sample check with your name and address. 15c. Stamping credits. Emblem Checks, Check Fobs, Name Plates. Mail Mfg. Co., Desk 2, 303 Degraw St., Brooklyn, N. Y.

FIRST class free to agents, men, women, demonstrate 25c household article. Quick seller, exclusive territory, constant reporter. P. M. King, Condensport, Pa.

WE manufacture highest grade sanitary wire frame brushes and cleaning specialties. New styles, quick repeats. Largest profits. Your territory is valuable. Write today. Kiesel Company, 71 Taylor St., Springfield, Mass.

LET me start you Manufacturing and Selling Retracts. H. Lake Co., Adair, Ill.

MAIL-ORDER Opportunities: 25 new propositions. No competition! Make 50c profit on dollar order; complete outfit 10c. Mail Dealers Wholesale House, 521 Franklin Bldg., Chicago.

\$35 TO \$100 weekly made easily selling our match lighting systems and portable lamps; they sell like wildfire both in towns and rural districts. No experience necessary; exclusive territory to right parties. Write for Free catalogue and full information; this is an opportunity of a lifetime. Dand Lighting Company, 174 D. No. Santa Ana, Chicago.

AGENTS—250% profit. Wonderful little article. Sells like wildfire. Can be carried in pocket. Write at once for free sample. H. Mathews, 1042 Third St., Dayton, Ohio.

EASY pleasant work for Mechanics. Shop Men, Clerks, during spare hours, will add many dollars to their salaries. Also want persons who can give full time. Big wages assured. Nately Gallery Co., 67 Bar St., Canton, Ohio.

AGENTS make big money and become sales managers for our goods. Fast office sellers. High profits. Particulars and samples free. One Up Pen Company, Dept. 2, Baltimore, Md.

AGENTS—\$50 weekly. We manufacture the best needle case made; a wonderful seller; 300% in 50% profit; talking unnecessary; our "True Scheme" envelopes do the work; general agents can make \$100 weekly; particulars free; 25c sample outfit for 10c; buy direct from the factory. Fair Needle Co., 102 Davis Sq., W. Somerville, Mass.

AGENTS Wanted—If you know a chance when you see it you'll see this one now. Big money—stable, fifty clothes—little work—no experience or capital needed—can you beat that? We want agents everywhere to take care of our business in their localities and to advertise our money, fifty suits by wearing them. We furnish everything complete and charge nothing for agents' outfit. The sweetest dressers everywhere are our agents and all we ask is that you tell people who inquire about your fine clothes where and how they can get them. You make big money—\$10 a day—without trouble. Just a postal brings you full outfit free. Big, new sample book of up-to-the-minute suitlines sent so you can pick out your best suits also measuring blanks and everything else needed. We pay express on everything—not a penny for you to pay. Send quick before some one else gets the agency there—mail postal today to the American Woollen Mills Co., Dept. 114, Chicago, Ill.

You can make \$184 as our general or local agent. Household necessity; extra 60 per cent; permanent business; exclusive territory; salary or commission; free sample; credit. J. P. Piskin, 113 Reids St., Newark, N. Y.

MAGAZINE Solicitors—For a high grade established national magazine, subscription price of which is \$3 per year, is taken by bankers, lawyers, and the well-to-do class of readers. The commission is liberal, and in some respects the proposition is a bit different from the ordinary magazine work. Only agents who can furnish unquestioned references as to reliability need apply; but to the right agents our proposition should appeal as a good and profitable one. The work is strictly on a commission basis. Address Publisher, 9th floor, 78 East Madison St., Chicago.

MEDALLIONS—300% profit. Make up your own goods and be independent. Catalogue free. Mesag Co., 1205 Randolph St., Chicago.

SELA, Dry Goods Remnants, Greatest bargains on earth. Remnant Store Co., Cincinnati, Ohio.

AGENTS make \$5 to \$10 a day on the spot. Atkinson writes: "The best proposition I have found in my forty years' canvassing." Permanent work. Household necessity. Earning 50%. Write today for General or Local Agents terms. Free sample. C. H. Stuart & Co., 16 Union St., Newark, New York.

YOU can be your own boss with our Key Check Outfit. Good for \$3 a day stamping names on pocket key checks, fobs, etc. Sample check with your name and address. 15 cents. Pease Die Works, Dept. M, Winchester, N. H.

\$50 WEEKLY to deliver "Kerosene" Lamp. Burns common coal oil. (Kerosene.) 300 candle power—low priced. Portable light. Costs one-third cent per hour to operate. Every home needs one. Big profits for agents. No experience needed. No capital required. Credit given. Blakson sold 24 first week. West, 3 first night. Write today for terms of free sample. Thomas Mfg. Co., 1162 West 88th, Dayton, O.

300 To 400% Profit to Agents selling our guaranteed U. S. Fire Extinguishers. Tremendous demand. Orders repeat. Exclusive territory to county and district managers. United Mfg. Co., 1025 Jefferson, Toledo, Ohio.

PERFECTION Ford Stationers for Ford Cars. Guaranteed to start any Ford car that is in running condition. Splendid proposition and inducement for state and county agents. The Perfection Auto Stationer Co., 1561-M Broadway, Denver, Colorado.

\$\$\$ EARNED daily demonstrating Kersgrin Gliders. No capital required. Hundreds succeed. Why not you? \$25 weekly easily earned. Pocket sample 4c. S. Mfg. Co., 20-X Warren St., N. Y.

FROM Dance Hall to White Slavery. 400-page, cloth book. Illustrated, 41. Immense sale. Experience unnecessary. Outfit free. Big money quick. Charles C. Thompson Co., Manufacturing Publishers, 1125 Wabash Ave., Chicago.

AGENTS—Here's a winner. The Midger Vest Pocket Garment Hanger—sells on sight. The most attractive proposition ever offered, 150% profit. No competition, as article is fully protected by U. S. and foreign patents. Address: Dept. "M," The Silver Company, 171 Madison Ave., New York.

NEW Automatic \$2.50 Adding Machine. Sell 10 a day easy. Big profit. Everyone buys. No competition. Biggest orders. O. Bassett, 3921 Indiana Ave., Chicago.

SPECIAL OFFER—Handy Tool Kit, containing Knife, Saw, Screwdriver, Chisel, Cripplebar, Capstern, Hammer, File, in leather case. Size, 4 1/2 in. Sent postpaid, \$1.75. Agents wanted. H. G. Rockley Co., 214 11 St.-A, Brooklyn, N. Y.

IDEAL Lamp Filler saves bother filling lamps. Men and women canvassers and agents. Good opportunity to make money. Samples A & B 25c. Harry Ottis Mayo, Box A2296, Boston, Mass.

MAKE \$28 a week easy. New meritorious household article. Absolutely original. Every household buys. Big, quick profits. Sample, 10c. Advance Mercantile, 523 E. 46th St., Chicago.

AGENTS—Write for new Portrait Catalog; also price on our Luxurious Crucifix and Match-Box. Pioneer Portrait Co., 1259 W. 63rd, Chicago.

BANKER'S Pay for Agent's Work. Starting at once with nothing—quitting at five with \$50, one man's record. New business—new invention. Millions sold, yet just introduced. Tremendous sales made even old agents. Daily profits equal week's wages. Grab's Foot Scraper on doorstep saves drudgery inside. One automatic operation cleans shoe. Agents selling \$6 daily, send 10 an hour. Territory free—worth fortune. Security Mfg. Co., Dept. 3, Toledo, O.

AGENTS—If you want to receive many desirable propositions to select from, tell us what line you prefer. Canvassing Agents' Registration Bureau, 123 Hart St., Providence, R. I.

PHOTO Pillow Tops, Portraits, Frames. Sheet Pictures, Photo China Plates. Subjects credited. Prompt shipments; samples and Cat. free to agents. 30 Days' credit. Jas. C. Haffey Co., Dept. A-1, Chicago, Ill.

SELL about music at 5c; make big profits. Samples and plan 10c. Dorey, 5170 Dorchester, Chicago.

AGENTS—Make \$54 week selling our specialties. Send 25c for sample and get net wholesale price list of money makers. Electric Appliance Co., Burlington, Kansas.

ENDLESS Neckties—Something new, twelve ties in one; costs no more than old style; may make \$70, three days; woman made \$92, week; write for special agents' offer. Endless Necktie Mfr. Co., Dept. 19, Kansas City, Mo.

NEW Vacuum Dinner-Pail. Keeps foods hot or cold 24 hours. Holds soup, stew, meats, beans, ice-cream, coffee, milk, etc. Sells on sight at big profit to workmen and housewives. Sample outfit \$2.50—money back if desired. Exclusive territory to firestormers. R. B. Grant, Belleville, N. J.

AGENTS! Mail Dealers! Attention! "The Laumeter" offers unlimited opportunities. Enormous profits. Interesting book of facts free. Your one big chance! Write today. Albert D. Lau (Director), Jersey City, N. J.

MEN wanted to carry Boiler Graphite and Steam Cylinder Oil as a side line, who are calling on steam plants. Nourse Oil Co., Omaha, Neb.

ANYBODY can earn \$20 weekly selling our household and office specialties. Lake Shore Manufacturing Company, Michigan City, Ind.

AGENTS! Earn \$1 or more an hour. All or spare time. "Try-it-before-you-buy-it" plan sells Climax Automatic Razor Sharpener to every man—150% profit. Write for exclusive territory and guaranteed sales proposition. Victor Specialty Co., 15 Victor Bldg., Canton, Ohio.

AGENTS—Snaggest Household Line on earth. Red-hot sellers, steady repeaters. Goods guaranteed. Over 100% profit. Write quick—hurry. E. M. Feltman, Sales Mgr., 568 Third St., Cincinnati, O.

LOCAL representative to sell article for home and auto owners; inexpensive, making quick sales; large profit. Request plan A-L. Parker Company, Box 93, Waterbury, Conn.

AGENTS—Great opportunity to be permanent representative largest manufacturing high-grade soap and toilet goods. \$25-\$75 weekly. Write for immediate appointment. E. M. Davis Co., R. 64, Davis Bldg., Chicago.

AGENTS! Sell the Auto Special Fire Extinguisher. Big profit. Easy to sell. Used everywhere. Don't neglect this opportunity. Write today. L. 53 Market Street, Portland, Maine.

AGENTS—To sell Electric Lantern in spare time or entire time. Sells at sight. No experience required. Big profits. O. W. Murphy Co., Havana, Ill.

AGENTS—\$1 daily selling our Handy Tool, 12 articles in one. Lightning seller. Sample free. Thomas Mfg. Company, 462 Third St., Dayton, Ohio.

AGENTS—New invention. Electric Chair Lubricator. Used on cigar cases. Quick seller to Hotels, Drugstores, Restaurants, Pool-halls, Cafes. Big profits. Special offer. Drake Mfg. Co., 142 Reed St., Milwaukee, Wis.

"KEOSK-KEYS" Puzzle. A challenge to your cleverness. A money-making miracle. Agents wanted. Sample 10c. Northern Mfg. Co., Canastota, Maine.

ADDITIONAL item: 800% profit to you. Clean-cut, week-day proposition. Full particulars 15 cents. H. I. Company, 79 Charles Bldg., Dayton, Ohio.

PORTRAIT Agents make big money selling our goods. Our quality is right. Prices low. Delivery guaranteed. Credit for rejects. Ask for our latest catalog. Adam J. Reed & Co., 602 Blue Island Ave., Chicago, Ill.

AGENTS—500% profit, free sample Gold and Silver Sign Letters for store fronts and office windows. Anyone can put on. Big demand everywhere. Write today for literal offer to agents. Metallic Letter Co., 444 N. Clark, Chicago, U. S. A.

LAST chance to get Free Panama Expedition Trigs. Write at once regarding offer; big profits; valuable premiums handling complete line unexcelled household articles. Territories. Marvello Company, Binghamton, New York.

AGENTS, Our New Safety Key Holder! "Hant-Lose Keys." Fasten at belt or trouser top. Easy seller. Holds keys, bags or keys. 50c dozen. \$5.25 gross. Sample 10c. Almore Co., 856 Belmont, Chicago.

AGENTS make big money selling automobile and motorcycle specialties: \$100 to \$300 a month easily made; free particulars. Write today. W. Davenport, 373 Carmichael St., Camden, N. J.

MAGIC Ink Erasers. No blade, no acid. Removes ink like magic. Sold as easily as bread in a family. Sample 10c. Sells 50c. S. Mfg. Co., 20-X Warren St., N. Y.

MAKE and Sell Your Own Goods. Our Information Bureau tells how. Free Formula Catalog for stamp. R. Mystic Company, National Union Building, Washington, D. C.

IT will pay you to write me before taking any agency for guaranteed aluminum utensils. Wm. J. Dick, Mgr., Dept. E-13, 20 W. Lake, Chicago.

ANYONE willing to assist American Air-Fleet and make some money besides, kindly send stamped envelope to "Air-Fleet," Times Sq., N. Y.

AGENTS—Salary or commission. Greatest seller yet. Every user pen and ink buys on sight. 200 to 500 per cent profit. One agent's sales \$620 in six days; another \$32 in ten hours. Monroe Mfg. Co., N. O., La. Orlose, Wis.

AGENTS are earning money selling our big 15c Packages of 20 Assorted Postal Cards. "3,000 Varieties." "Big Profits." Sell everywhere at sight. Sample Package 10c. Particulars Free. Sullivan Card Co., 1234 Van Buren St., Chicago, Ill.

THE best paying agency proposition in the United States. Exclusive territory guaranteed. Experience unnecessary. Big money easily earned. We show you how. United Cutlery Company, Canton, Ohio.

WANTED—Distributors. Men and Women—to give away free pkgs. Perfumed Borax Soap Powders; no money or experience needed; good pay. S. Ward & Company, 213 Institute, Chicago.

AGENTS to sell Patented Rubber Stamps to banks, offices and stores. A. S. McGreevy, 4630 Lancaster Ave., Philadelphia.

AGENTS—Sell rich-looking imported 20x38 Buxs. \$1 each. Carter, Tenn., and 115 in 4 days. Profit, \$57. You can do same. Write for sample offer selling plan; exclusive territory. Sample cut by parcel post prepaid. 30c. Condon, Importer, South-Weston, Maine.

SOAP Agents—Our Vegetable Soap, toilet articles, hairings, remedies, cream and out-sell. Sample free. Buchanan & Co., 51 N. Main St., St. Louis, Mo.

BOYS—You can earn five dollars easily. Particulars free. P. Simco, Havermere Bldg., New York.

GREATEST selling novelty—Tie forms and braids ties. Sample forms and tie sent prepaid for 25 cts. Penton Novelty Co., 518 West 126th Street, New York.

AGENTS Wanted—Right here is the one big chance of your life. If you want to make good money—\$10 a day or more, as easy as peddling off a log, and get your own clothes free besides, you can do it by acting as our agent. We are the biggest people in the business and want our agents to make big money and be happy, stylish dressers. Send a postal today for free \$10 outfit, including a big book of nobby anti-bug samples to select your own agent's suit from. Then take orders from people who admire your dandy clothes. They come to you—not you to them. This is the way to get rich—the sure, easy way. Remember, you need no money—everything is furnished by us free. We pay express on everything. Just send a postal, but do it today. You can't get started too quick, making this big money and wearing these stylish clothes. Address card to Paragon Tailoring Co., Dept. 111, Chicago, Ill.

We pay \$50 a month salary and furnish all expenses to introduce our guaranteed poultry and stock pointers. Address Higler Company, X363, Springfield, Illinois.

AGENTS of ability and high character wanted on a new household article, over 100 per cent profit. Special selling plan that pulls results. Address Merritt & Brock, 59 to 69 Temple Place, Boston, Mass.

AGENTS—New Washing Machine. Wonderful invention. Generates own power. Forces twenty streams boiling suds through every fibre of clothes. No rubbing. Sells itself. \$10. Free sample. Geyser Washing Machine Works, Chicago.

AGENTS and Mail Order Dealers, our new safety toothbrush is the household article you have been looking for. Seals and turns impossible. Fast and easy seller. Write for particulars. Webber Manufacturing Co., 1097 Warner Ave., Peoria, Ill.

AGENTS Wanted—To handle the newest electrical window sign on the market. Every merchant interested. Flashes colored signs; wording can be changed instantly. Write for particulars at once; territory being assigned now. The Atlas Mfg. Co., Cincinnati, O.

QUICKERLIGHTING cleans the hands quickerlighting—Agents wanted. Joliet Novelty Co., Joliet, Ill.

AGENTS, either sex, sell Ho-Bo-Co. Skin and scalp soap, perfume, toilet articles. Big profits. We help earnest workers. Holbro, 212 N. Second St., St. Louis, Mo.

Big Kansas Company will start ambitious man or woman in fast growing business; any locality; \$3,500 yearly; spare time; no canvassing; no experience. We furnish everything. Write for unique selling plan. C. W. Eversont, President, 160 E. 5th, Pittsburg, Kansas.

PHONE-MEGA—Wonderfully improved. Makes telephone private. Whirlwind seller for agents. Sample 20c. Send for free booklet. "Don't play—Just whisper." Phone-Mega Mfg. Co., 2214 Glenview St., LaSalle.

NEW 1914 Model—Send no money. Just your name written plainly on a postal card and learn by return mail how to get the best Vacuum Cleaner on the market, without costing you one cent! We are putting them out for demonstrating purposes. Guaranteed 5 years. Reliable. Live agents wanted everywhere. Write today to Warner Vacuum Cleaner Company, Dept. Z, Maumee, Ind.

200% PROFIT. You can't beat it. Sells everywhere. Free pocket sample. Our goods get the orders. Wm. J. Dick, Mgr., Dept. R-4, 20 W. Lake St., Chicago.

U. S. GOVERNMENT uses Richmond Chemical Extinguishers that kill gasoline fires. Auto and factory sales. District Managers make 500% profit. Auto free. Richmond Chemical Co., Desk 1132, Wheeling, W. Va.

\$61.50 WEEKLY introducing and selling a new gas light burner for kerosene lamps. Beautiful light. No chimney. No mantle. Perfectly safe. Simple in construction. Nothing to get broken or out of order. Will not burn out. Durable. Will last for years. Low price. Easy to sell. 200 per cent profit. Experience not necessary. Sample free. Why not try one on your lamp? Beware of imitations. No branch offices. Luther Manufacturing Co., Dept. 353, Cincinnati, Ohio.

OPERATE profitable Mail Order Book business. 700% clear profit each sale. Gives perfect satisfaction. Descriptive folders. Rollins, Tremont Row, Boston.

STOP Here—Agents, Salesmen—Just Out—brand new invention. Splendid seller. Deflector for Automobile Headlights—puts light on the road instead of in other people's eyes. Not a dimmer—makes driving light stronger. Endorsed everywhere. No knobs to turn—no adjustments—lasts as long as the car. Simple, easy to put on. Wanted on every car—sells like lightning. Nothing like it—patented. Big profits—Lisken, Johnson, Ohio, made \$25 first day. Harris, N. Y., made \$68 one week. Walker, Iowa, cleared \$58 in three days. Hurry—write for details—Sales guaranteed—no charge for territory. Address the Hickmeyer Deflector Company, 432 S. & B. Bldg., Toledo, Ohio.

AGENTS—To sell the newest electric appliance on the market; sold everywhere there is electricity, in the home and office; liberal profits; sales-driving sample, weighs a pound, no experience or knowledge of electricity required; it shows how to use one light instead of two and get the same results; sells for \$3.50 and saves the purchaser an investment of \$25; write for particulars. The Handy Light Co., 12 Handy Light Block, Cincinnati, Ohio.

GASOLINE table lamps, lanterns and flat irons. We make a specialty of accessories for helium wire systems. Gas and gasoline mantles at lowest possible prices. Money refunded if not satisfactory and all charges paid. Our prices enable agents to meet all competition. Grand Rapids Novelty Co., Grand Rapids, Mich.

AGENTS—\$15 profit on two sales a day. Machine line seller to saloons. Free sample and salesmanship course. Write Mohler, 1059 North California Ave., Chicago, Ill.

LIFETIME opportunity—Manufacture "Sutcliffe for Eggs." Enormous profit. No canvassing. Particulars free. W. C. Belach, 419A, South Pickett, Los Angeles, Cal.

100% PROFIT. Metallic Sign Letters. Co-operative business proposition free. Johnson Co., Quincy, Ill.

100% PROFIT—Exclusive territory to first five men. Remson Safety Razor sells on sight. Send 25c for samples today. De Hart Co., Butherford, N. J.

AGENTS wanted to take orders for clothing and business cards; large profits; outfit free. Foreman Printery, Waterbury, Conn.

LIVE agents make 100% profit selling our mouth-organ self-instructors; something new; sample and particulars, 10c. Peter Montfort, 19 Maritime Building, New York.

VEST Pocket Coat Hanger. Prices and sample, 25c. Big profit. See December Popular Mechanics, page 928. E. Hutchinson, Windsor Ave., Elmira, N. Y.

SELL Electrical Specialties. Our interchangeable Electric Signs make big money. High grade proposition to live agents. F. A. Walden, 551 West Washington St., Chicago, Ill.

AGENTS are coming big money selling our new "Shine-Rite" Polishing Cloth. A whirlwind seller. Sample and particulars free. Kemmons Co., Springfield, N. J.

HABGAINS—Men's Neckwear. Agents, stockholders. Webster, 477 Eighth Avenue, New York.

I AM Manufacturer's Sales Agent for a number of valuable articles, and want reliable agents, either sex, who desire permanent and profitable connections, on regular commission and bonus contracts. Ed. H. Irwin, Carthage, Mo.

AGENTS, a real cash getter, and more; gets the money in even hard times. Write G. R. Whitehead, Mgr., 323 Chicago St., Elgin, Illinois.

LEADERS: Hygienic Milk Bottle Holder, "Dandy" Mail Box, Perfect Dust Beater. Catalog, 50 specialties, free. Weymouth Household Supply Co., P. O. Box 287, Springfield, Mass.

AGENTS—Make \$99 a week; sell 25c sheet music at 5c. Every one buys. Samples and plan free. Republic Novelty Co., Webster Bldg., Chicago.

COST 1c, sell for 10c. Ready-made sign letters anyone can apply. Unlimited demand. Five samples. Instructions, 10c. Particulars free. Everbrite Co., Long Island City, New York.

AGENTS—Get our Big Three selling combination. Hundreds orders. Exclusive territory. Sample free. A Leader, 724 West 18th Place, Chicago, Ill.

AGENTS Wanted—Agents make 500 per cent profit selling "Novelty Sign Cards." Merchants buy 10 to 100 on sight. 500 varieties. Catalogue free. Sullivan Co., 1231 Van Buren St., Chicago, Ill.

AGENTS—A free course in General Salesmanship is given to every man of our Sales Organization. This organization is a body of successful men selling the Handy Light; that unique electrical device which cuts the cost of electric lighting in half. Sells for \$3.50; is used in home, office store, factory; weighs only one pound. Sold by demonstration. All agents furnished with well planned methods for gaining interviews. A high-grade business for a man of ability and standing in his community. General Agents preferred. Inquire for our full proposition by addressing The Handy Light Co., 128 Handy Light Block, Cincinnati, Ohio.

AGENTS! Double your income! Tackle your sales. The Agents and Mail Dealer's Magazine shows how to buy Right. \$2 articles cost you 30c; Quarter articles, 2c. Fifteen other rare bargains. It puts you next to original manufacturing plants, mail-order schemes with enormous profits, etc. Two big money-making issues for 10c. Agents' Magazine, 100 Franklin Building, Chicago.

AGENTS, Ladies or Gentlemen; Sell Kitchen Utensils. Cuts 5c, sells for \$20, 14 uses in one. Machine furnished for making article. Every demonstration a sale. \$75 weekly easy. Demonstration folder free. Process Company, Dept. PM3M, Salina, Kans.

AGENTS, mail-order men. Honolulu is the market place for Japanese toys, novelties, dolls, china-ware. Send one dollar for an open order of samples of toys, rugs, etc. Satisfaction guaranteed. Send stamp for particulars. (We have no catalogue.) Address T. J. Mc, Mgr., Box No. 1242, Honolulu, T. H.

OPPORTUNITY for reliable person. permanent income \$15 to \$50 weekly with Flora Stone, wonderful oriental fragrant stone. New, big seller, full or spare time, experience unnecessary. Write quick. Art Stone Co., 451 W. 37th St., New York City.

SELL Oil Painted Pillow Tops. Beautiful designs. Retail \$1. Cost \$4 doz. Complete sample and particulars, 25c. Fantus, 521 Dearborn, Chicago.

I HAVE a contract to distribute a million free packages Borax Soap Powder. Want reliable men and women to help. Chance to earn good pay. L. Waterly Brown, 730 N. Franklin St., Chicago.

GENERAL Agents—Capable of calling on the big trade themselves and handling canvassers for the home to home and office to office business, to sell the newest electric specialty on the market; sold everywhere there is electricity. In the home, office, factory, store, hotel; liberal profits; sales-driving sample, weighs a pound, no experience or knowledge of electricity required; shows how to use one light instead of two and get the same results; sells for \$2.50, \$3.50, \$5 and gives the purchaser an investment of \$25. Write for particulars. The Handy Light Co., 128 Handy Light Block, Cincinnati, Ohio.

I NEED branch managers for my worldwide mail-order business. Operate from your own home in spare time. No canvassing or peddling. Experience unnecessary. You should make \$50 weekly. Butler, 180 Facelles, Toledo, O.

CHRISTY Mathewson's Invention. Exciting home baseball game, sells in offices or homes like wild fire. Big profits. Details free. Mathewson Game Co., Dept. 30, Cincinnati, Ohio.

NEW, practical, profitable specialty, every merchant buys. Snap for agents. Columbia Co., 115 North Ave., Chicago.

AGENTS—Artwork cost 50c, sell \$5. Easily sold up-to-date window letters, anyone can put up. Samples free. Embossed Co., 2515 Lincoln Ave., Chicago.

MAIL Order Dealers: Your 25-word trial ad in the "Lover" Supplement 15c; additional words 1c each. The "Lover" Supplement, 43, Elizabeth, N. J.

LIVE agents wanted in open territory for the new 1915 line of Eagle motorcycles. Write for circular and proposition. Act quick and make good money as our local representative. Sterling Motor Company, 720 Centre Street, Brockton, Mass.

AGENTS—To solicit orders for Finest Quality Business and Calling Cards, write for sample and profit sharing plan. Sterling Print, Dept. M, Sterling, Mass.

"FACTORY to Post" Place line of men's, women's and children's hosiery. Sample pair men's artificial silk, 25c. Box of four pair, 80c. Good profits to agents. W. M. Co., Box 305, Troy, N. Y.

USE your spare time to build up a mail order business of your own. We help you start for a share in profits. 27 opportunities. Particulars free. Opportunities Exchange, Buffalo, N. Y.

SALESMEN WANTED

WE have been using display space in various publications to interest factory, railroad, factory and other purchasing agents in Glashite, a dry window-cleaning compound that removes the worst forms of dirt and put instantly, leaving the windows with a brilliant, dirt-repelling polish which keeps them clean twice as long as usual. Now we want men of ability to go direct to these purchasing agents with our proposition. We have closed many by mail—that is in itself proof of the fact that there is a need and a desire for our product. Field unlimited. Each sale means a steady customer. To men capable of taking a territory for us we have a liberal commission and exclusive sale proposition that means several thousand dollars a year. Territory going now. Tell us who you are, what you have done, and we will make you a proposition fitted to your ability. Write today, Glashite, 143 Leicester St., Detroit, Mich.

SALESMEN—We have some excellent territory open to salesmen of ability. This is a proposition that appeals to the best class of concerns. Sales are easy and profit large. Write us today, for catalog P. M., covering the Schick All-Steel Paper Hairs, Davenport Mfg. Company, Davenport, Iowa.

WANTED—First-Class Specialty Salesmen to represent factory direct and sell our chinaware to retailers and premium users. Big money for live wires. Worcester China Co., Sebring, Ohio.

TRAVELING and Local Salesmen to sell Transo (transparent) face envelopes. Every business house a possible customer; excellent proposition, commission basis. Transo Paper Co., Chicago.

SALESMAN—Experienced traveling salesman. State experience and references first letter. Well advertised line. Satisfactory commission. The Limoges China Co., Sebring, Ohio.

MAGAZINE Solicitors—For a high-grade established national magazine, subscription rates of which is \$3 per year. Is taken by bankers, lawyers, and the well-to-do class of readers. The commission is liberal, and in some respects the proposition is a bit different from the ordinary magazine work. Only agents who can furnish unquestioned references as to reliability need apply; but to the right agents our proposition should appear as a good one and profitable. The work is strictly on a commission basis. Address Publisher, 9th floor, 75 East Madison St., Chicago.

WANTED—Wishers to take orders for made-to-measure, high grade men's tailored suits from \$7.00 to \$22.00. Make \$25.00 to \$50.00 weekly. Elegant large look outfit free. Experience unnecessary. No pocket folder affair. Splendid opportunity to make money. Handy Dandy Line, Dept. 8, Saukageon St., Chicago.

MANUFACTURER requires general agents for patented demand of centuries. Three minute demonstration convinces. A financial independence to acceptable parties. Samuel C. Osborn, Masonic Temple, Chicago.

WANTED—High class side line salesman covering the garage trade of the United States. Best proposition in America. Write us, La. 1, 551 Academy St., Kalamazoo, Mich.

SALESMEN—Get our plan for Monogramming Automobiles and Motorcycles by transfer method. Very large profits. Motorists' Accessories Co., Oakland, O.

EARN \$50 to \$150 weekly selling new specialty to merchants. Details \$12.50, your profit \$8.50; no competition. Exclusive territory. Free samples and descriptive matter. Sayers Co., 405 Olive St., St. Louis, Mo.

WANTED—Distributors. Men and Women—to give away free plugs. Perfumed Borax Soap Powders; no money or experience needed; good pay. S. Ward & Company, 218 Institute, Chicago.

WANTED—Salesmen for high-class, electric Vacuum Cleaner. Unusually attractive proposition. Western states. State your experience. 528 Paxton Block, Omaha, Neb.

SALESMEN—Business producers to sell our high-grade Punch Bunked Deals. Large commission. Chas. C. Shack, St. Joseph, Mich.

TRAVELING Salesmen Wanted—Experience unnecessary. Earn big pay while you earn by mail during spare time; only eight weeks' time required, one or two hours a day. Steady position, easy work, hundreds of good positions to select from. Write today for free book, "A Knight of the Grip," containing full particulars and testimonials from hundreds of students we have recently placed in good positions and who are earning \$100 to \$500 per month. Address: Dept. H-16, National Salesmen Training Association, Chicago, New York, Kansas City, San Francisco.

HELP WANTED

STOP Here! Let us start you in a home business that will bring you money every day. Experience unnecessary. Spare time. No cashing. I furnish everything. Send for proofs. Voorhes, Josh C. H., Omaha, Neb.

RAILWAY Postal Clerks Wanted, \$15.00 month. Also Job. Write immediately for full particulars. Franklin Institute, Dept. N-21, Rochester, N. Y.

RAILROAD Men! Investigate opportunity to increase earning capacity by taking our practical instructional course. The Railway Educational Bureau, Union Pacific Headquarters, Omaha, Nebraska.

GO on the Stage. Vanderbilt career offered you. Experience unnecessary. Managers endorse my method. Instructive vaudeville book free. Write today. Fredette Labelle, 814, 10, Jackson, Mich.

A MONEY Proposition—Co-operate with me in a profit-sharing mail-order business. Will place trial advertisement, furnish printed matter, goods to fill orders and divide the profits. Particulars, Desk 163, Hagen A. Horton, Tekonsha, Mich.

GOVERNMENT Examinations. Meet thorough preparation. \$5; returned if not appointed; particulars free. American Civil Service School, Washington, D. C.

WHITE Moving-Picture Plays. \$50 each. All or spare time. Correspondence course unnecessary. Details free. Atlas Publishing Co., 3015, Cincinnati, Ohio.

BE a Detective—Earn \$25 to \$35 weekly; chance to see the world with all expenses paid. Leading System, Dept. 304, Boston, Mass.

BE a Detective—Earn from \$150.00 to \$300.00 per month. Travel over the world. Write C. T. Ludwig, 340 Westover Building, Kansas City, Mo.

POSITIONS men, Central and South America. For particulars address The Universal Co., Panama, Republic Panama.

BECOME detectives—Large salaries; nice work; experience unnecessary; write Superintendent Wagner, 1243 Lexington Avenue, New York.

WOMEN—Wanted, Get Government Jobs, \$65.00 to \$150.00 month. 2,000 appointments monthly. Write for list, Franklin Institute, Dept. N-21, Rochester, N. Y.

I GUARANTEE \$10 for first photograph you write by my method. As former newspaper editor, I speak with authority. Send for free booklet, "How to Write Photographs." Elbert Mingo, Box 772, P. F., Chicago.

OWN a business. Co-operate with me evenings at home. Everything furnished. Don't worry about capital. Boyd H. Brown, Dept. K-1, Omaha, Neb.

WE need salesmen in every line of merchandise, office managers, clerks, engineers, draftsmen, etc. Southwest Business Men's Clearing House, Kansas City, Mo.

Be a Detective; earn \$25 to \$125 per week; travel and see the world; good opportunities; fascinating work. Booklet free. National School of Detectives, 489 Fifth Avenue, New York, Room 334.

FREE Illustrated Book tells of about 200,000 protected positions in U. S. service. Thousands of vacancies every year. There is a big chance here for you, sure and generous pay, lifetime employment. Just ask for booklet 9-29. No obligation. Earl Hopkins, Washington, D. C.

MEN wanted in all localities; \$20 weekly and permanent position showing samples. Large mail-order house. Outfit free. Highest references furnished. American Grocery Co., Port Huron, Mich.

WANTED—Men 18 to 35 to become Railway Mail Clerks, \$75.00 month. Examinations announced Jan. 15th. Schedule and sample questions free. Franklin Institute, Dept. N-21, Rochester, N. Y.

If you are tired of working for other people, if your income is too small, or if you are looking for sparetime work write to Mr. Singer, Haunceck, Wis. He will put you right.

BE a Detective. Earn big money. Write John J. Gilles, Licensed and Bonded N. Y. State Detective, Retired Member N. Y. Police Dept. 22 years experience. 234 Huguenot St., New Rochelle, N. Y. Investigation solicited.

\$25.00 to \$150 month paid men and women. Government life jobs. Common education sufficient. 2,000 appointments every month. Write immediately for free list of positions. Franklin Institute, Dept. N-21, Rochester, N. Y.

MAKE Money Writing Stories or Articles. Big pay. Free booklet tells how. Address United Press Syndicate, San Francisco.

CHRISTY Mathewson's Invention. Exciting home baseball game sells in offices or homes like wild fire. Big profits. Details free. Mathewson Game Co., Dept. 136, Cincinnati, Ohio.

SILVERING Mirrors and Auto-Trimnings. Plating laboratory home. Plans free. Clarence Sprinkle, East Grant, Marion, Ind.

PROFICIENT Fireworker or Manual Training Teacher wanted each section for demonstrating and selling. W. R. Price, New York.

LEARN Tactile Mirror Silvering—It Pays! Long closely guarded secret of big factories. Particulars Free! Wm. Barstow, 514 23rd St., Oakland, Calif.

I HAVE a contract to distribute a million free packages of Borax Soap Powder. Want reliable men and women to help. Chance to earn good pay. E. Waverly Brown, 134 N. Franklin St., Chicago.

GOVERNMENT Jobs, \$75.00 month. List free. Franklin Institute, Dept. N-21, Rochester, N. Y.

LEARN automobile repairing driving on up-to-date cars; electrical, civil engineering, surveying; methods most practical; room and board while learning; positions secured; satisfaction guaranteed; catalog free. National School of Engineering, 2110 West Seventh, Los Angeles.

WANTED—An Idea! Who can think of some simple thing to patent? Protect your ideas; they may bring you wealth. Write for "Needed Inventions" and "How to Get Your Patent and Your Money." Randolph & Co., Patent Attorneys, Dept. 143, Washington, D. C.

BE a detective; earn \$30 to \$100 weekly; travel all over the world. Write Dept. 117, United States Detective & Adjusting Agency, Railway Exchange, St. Louis, Mo.

ANYONE can earn \$25 weekly silvering mirrors; no capital. Write Wallace Abell, Lima, Ohio.

CIRCULAR Distributors send for Application Contract Sample Magazine. Backley's Distributing Agency, 403 Biadville, Pennsylvania.

WE have the best auto accessories; every motor owner buys; quick sales, big profit; samples free to worker or salesman. Write today for territory. A. C. Follie, Mgr., American Carbonator Co., 3805 Carpenter St., Chicago.

INCOME Railway Mail Clerks, \$75.00 month. Examinations coming. Sample questions free. Franklin Institute, Dept. N-21, Rochester, N. Y.

YOUR Cooperation—\$500 annually; commercial information wanted; confidential. Commercial Information Company, P.M.C., Peru, Indiana.

YOUNG Men! Learn Drafting—one of the most practical subjects of study today—indispensable in many occupations—engage in individual study successfully with the aid of our new book, "A Practical Course in Mechanical Drawing," 160 pages, 157 drawings, cloth, 50 cents, postpaid. Popular Mechanics Book Dept., 6 S. Michigan Ave., Chicago.

WANTED—Distributors, Men and Women—to give away free plugs. Perfumed Borax Soap Powders; no money or experience needed; good pay. S. Ward & Company, 218 Institute, Chicago.

GET a Government Job! See ad on page 12. Write now—today! Particular Civil Service School, Rochester, N. Y.

WANTED—Men familiar with automobiles, motorcycles or gas engines to act as District sales managers for the Arco Motor-Vogue—the wonderful nationally-advertised two-passenger motor vehicle, retailing \$285. Exclusive territory, liberal compensation for short season work. Splendid opportunity with big, responsible company. Arco Motor Company, Inc., Dept. B, Jackson, Mich.

FIREMEN, Draftsmen, all railroads, \$120. Experience unnecessary. Send age, postage. Railway Association, Dept. 298, Brooklyn, N. Y.

WANTED

COPPER tube automobile boilers bought, sold and repaired. Lucas & Son, Bridgeport, Conn.

WANTED—A second-hand drill press, in good condition. F. E. Mason & Son, Hastings, N. Y.

WE buy all scrap metals and specialize in nickel and mixed metal scrap. E. M. Moers' Sons, 183 1/2 South St., New York.

GUNS, SPORTING GOODS, ETC.

FIREARMS Wanted. Buy, sell or exchange all sorts. Stephen Van Brouckelaer, Dept. 18, West Orange, N. J.

WILL sell brand new Remington 25-caliber rifle costing \$20 for \$17. Geo. Boyce, Rossville, Mo.

FOR SALE

VACUUM cleaner pumps and parts for assembling, since 75%. Vacuum Supply Co., Ann Arbor, Mich.

HUNTER's acetylene gas generator and lighting fixtures \$35. Clyde Clark, Mendon, Mich.

FOR Sale—\$4,000 modern printing plant, \$1,500. Circular. Larow, Box 127, Knoxville, Tenn.

FIELD-MARINE Day and Night Glasses with case, 25-mile adjustment; \$30.00 value only \$6.50. Money back if not satisfied. Ye Christy Shop, 20 S. Second St., Philadelphia, Pa. Fine Christmas present.

5 1/2 x 10 1/2 "PILOT" side lever hand printing press, extra good condition, \$25. H. Newham, Waukegan, Ill.

SALE OR EXCHANGE

EXCHANGE 25c and 50c California gold coins for Indian relics, guns, pistols, knives and curious things. G. J. Carey, New Rochelle, N. Y.

EXCHANGE—Long's Popcorn Chaperone machine for motorcycle sidecar. Luter, Kampmann Bldg., San Antonio, Texas.

MACHINERY, TOOLS AND SUPPLIES

REBUILT Leather Belting. Half the price, equal new in service, excellent appearance, all sizes, satisfaction guaranteed. Also new, 25% under dealers' prices. Canvas and rubber belting. Freadrich Belting Co., Manufacturer, St. Louis, Mo.

HAVE for sale several sizes of lathes, milling machines, drill presses, punch presses, shapers, planers, boilers, steam engines, oil, gas and gasoline engines and non-working machinery. Plummer, 122 Water St., New York, N. Y.

ENGINE Lathes, swings 2 1/2 in., takes 2 1/2 in. between centers. Complete set gears cutting all size threads 3 in. to 40 in. \$12.50. Gravman & Sons, Allentown, Pa.

FOR Sale—25 Lincoln milling machines, \$25 to \$100 each. Lucas & Son, Bridgeport, Conn.

IF you expect to buy new tools, write us what you want. We can save you money. Metro Parts Listing Company, Tool Dept., Detroit, Mich.

DEPARTMENT Store, mechanical and electrical steam and gas new and used equipment. Guaranteed thirteen candle power carbon lamps, two hundred in box, six dollars hundred. Edgar M. Moore & Co., Pittsburgh, Pa.

PULLEYS, Gears, Sprockets, Shafting, Hangers; see page 132. W. A. Jones Foundry & Machine Co., Chicago.

VACUUM cleaner pumps, tools, etc., for stationary house or wagon outfit. Vacuum Supply Co., Ann Arbor, Mich.

FOR Sale—Electric motor, 40 horse-power, good as new. Steam tugboat, 28" Barnes vertical drill press, flexible band and power planer 18"x10"x24" with milling attachment, 1/4 horsepower turret motor. J. Buschel, New Orleans, La.

DRUMMOND "Tool-less" self-acting, sliding, boring, screw cutting and milling guaranteed lathes, extending eight inches; forty-two dollars. Book "Lathe Work" free. W. R. Price, New York.

BARGAIN—4 Celebrated Evans Variable Speed Comminutators, new and used; speed change 1 to 6, 2 sizes. Cost \$35 and \$30. Make an offer. Doran Brothers, Danbury, Conn.

CARROLL, 167 Post-Power Lathes, in-complete, \$29.50; new 10" Barnes Lathes, compound rest, \$66.50; 10" Sebastian 30" centers, \$30; 20"x20" Ames, \$27.5. Also Shapers, Drills, Planers, etc. Western Machinery Co., Cincinnati, Ohio.

JUST Published—Popular Mechanics Shop Notes for 1935—426 Easy Ways to do Hard Things. This is Vol. XI and is similar in style to the other numbers in the series, 224 pages, 517 illustrations. Paper 50 cents. Cloth, \$1, postpaid. Popular Mechanics Book Dept., 6 N. Michigan Ave., Chicago.

ENGINES AND MOTORS

GUARANTEED, alternating current, single-phase Wagner motors 1/2 Hp., \$38; 1 Hp., \$52; 2 Hp., \$70; 3 Hp., \$85; 4 Hp., \$100. Motors brought, sold. Tell us your needs. Send for bargain list electrical supplies, flashlights. Hyge Electric Co., 415A So. Dearborn St., Chicago, Ill.

ELECTRIC vehicle motor, differential and brake complete. Stearns, Paxton, Illinois.

FOR Sale—Fifteen-horse gas engine, fine condition; cost \$150; check for \$150 takes it. Pelton's Monument Works, Erie, Pa.

FOR Sale—Kerosene engine—Arme Automatic Safety, 4 H. P., made by Rochester Machine, Rochester, N. Y. Out of use 2 years—needs tuning up. P. O. R. Boston, 450, Francis Square, 230 Atlantic Ave., Boston, Mass.

FOR Sale Cheap—Englar, 10-hp., ten-cylinder vertical, four-cycle, water-cooled; for price and description write W. F. Harris, 705 Main St., Joplin, Mo.

FOR Sale—20 H. P. Marlow Engine, complete with reverse gear. Bargain, \$115. Chas. Stillman, Elgin, Ill.

SIX Horse Weber Gas Engine, \$75. Good as new. Saffiger Baking Co., K. C., Mo.

JUST Issued—Amateur Mechanics No. 6. Another great book of 203 articles for those who like to make things. Similar in style to the other numbers in the series, 128 pages, 261 illustrations. Paper. Price 25 cents postpaid. Popular Mechanics Book Dept., 6 N. Michigan Ave., Chicago.

REBUILT Engines—We have on hand a number of rebuilt "Buffalo" engines, guaranteed, at greatly reduced prices. Write for bargain list. Buffalo Gasoline Motor Co., 1290-1305 Niagara Street, Buffalo, N. Y.

FOR Sale—20 H. P. White Steam Engine, \$30; 1 1/2 H. P. steam engine, \$10; 2-cylinder air-cooled gasoline engine, \$25. Safety valves, any pressure, 50c each. 2423 North Ave., Bridgeport, Conn.

12 TWO cylinder steam automobile engines, \$12 each. Lucas & Son, Bridgeport, Conn.

FOR Sale—One Ideal steam engine \$210; \$150; one 1/4 H.P. Emerson A. C. motor, new, \$17. One 5 H.P. vertical steam engine, \$30. Fine condition. Bargains. Address Jas. P. Larson, Lakota, N. Dak.

FOR Sale—Castings for two cycle engines. Richards Iron Works, Manitowoc, Wis.

107 Small Generators—All new 110 volts, 8 lights \$6.50 and \$8; 8 lights, \$10; 10 lights, \$12. Several larger. Johnston, Reams Ave., Ingram, Pa.

CASH Bargains—Eight-inch Ford Wayne fan and motor D. C. 110, \$3; large four bar magnetos, \$2; new G. E. 1/2 H. P. A. C. re D. C.; cost \$14, now price \$7 if this ad is sent with order. Edgar Phillips, 301 St. Paul Ave., Detroit. Send for Bargain Sheet.

FLOUR & FEED MILLING MACHINERY

SPECIAL bargains in second hand Attrition mills, burr mills, crushers, corn shellers, bran sifters, dust collectors, purifiers, rods, double, single, 2 and 3-pate high roller mills, shoe bolters, receiving separators, crushers, etc. Write for descriptions and prices. Sprout, Waldron & Co., P. O. Box 429, Muncy, Pa.

BOATS, LAUNCHES, ACCESSORIES

MOTORBOAT Encyclopedia—A 150-page book that tells 1001 things every motor boatman should know. How to overcome engine troubles. Price \$1, postpaid. Popular Mechanics Book Dept., 6 N. Michigan Ave., Chicago.

FOR THE SHOP

BOYS! Twenty years helping boys make things. Easy working drawings and explanations for many delightful wood-working projects. Send one dollar for set, Bryant, Superior Manual Training, 150 Capitol Avenue, Hartford, Conn.

14" SURF cutters, \$45. Lucas & Son, Bridgeport, Conn.

FOR That Boy—He with appreciate a copy of the great boy's book "The Boy Mechanic" that tells about 700 different things for boys to do and has 800 pictures, 180 (7x10) pages, cloth, big, handsome book for the price, \$1.50 postpaid. Popular Mechanics Book Dept., 6 N. Michigan Ave., Chicago.

BLACKSMITHS

BLACKSMITHS, get out of the rut; be progressive. Get Toy's modern methods of doing hard jobs easy. Make solid wheels. Temper all tools to a standard with Toy's Colored Tempering Charts. Do the job the other smith can't do. All for \$1. Send for free samples, W. M. Toy, Shiloh, Ohio.

BLACKSMITHS—Learn hand-wrought ornamental ironwork. Our 200-page book "Hand Forging" points out clearly all the guiding principles and methods which underlie all forge work. Written by a practical authority, 122 illustrations, cloth, \$1 postpaid. Popular Mechanics Book Dept., 6 N. Michigan Ave., Chicago.

SHOP Notes—Many valuable hints for blacksmiths are contained in our series of Shop Notes books. 10 volumes, 50c each, postpaid, or \$5 per set prepaid. Popular Mechanics Book Dept., 6 N. Michigan Ave., Chicago.

CEMENT

IF you want the best information on cement and concrete construction, subscribe for Concrete-Cement Age, leading cement and concrete monthly. Sample copy, 10 cents. Yearly subscription, \$1.50. Concrete-Cement Age, 135 Newberry Bldg., Detroit, Mich.

ELECTRICAL

3 AND 4 Bar Magneto Generators. Just the thing for experimental purposes. Shocking machines, bell ringing, etc., etc. Price, \$1. Keystone Novelty Co., 127 Locust St., Columbia, Penn.

"BOY Electrician." Make Batteries, Dynamos, Motors, Electric Engine, Telephone, etc. 75 illustrations, 16c. Keweenaw Dry Batteries, 3 guaranteed processes, 20c. Novelty Shop, 3511-U, Belleplaine Ave., Chicago.

SEND for bargain list electrical supplies, flashlights, etc. Hyge Electric Co., 613-R S. Dearborn St., Chicago.

ENGINE CASTINGS AND BLUE PRINTS

GASOLINE Engine Castings, with drawings. Cheap. Catalog for stamps. Novelty Manufacturing Co., 253 West 6th St., Cincinnati, Ohio.

SMALL Gasoline Engines and Castings with drawings. Stamp for circular. Crown Motor Works, Elgin, Ill.

RARE COINS

\$1.25 EACH Paid for U. S. Flying Eagle Coins dated 1858. We pay cash premiums on hundreds of old coins. Send ten cents at once for New Illustrated Coin Value Book 437. It may mean your fortune. Clarke & Co., Coin Dealers, Box 15, Le Roy, N. Y.

\$50 PAID for Half Dime, 1853, no arrows; \$5 for 1818 Half, \$5, 30c, \$300 for 1891 Dime, 8c. Mine. Many valuable coins circulating. Get posted. Send 1c. Get our Illus. Coin Circular. It may mean large profits to you. Send now. You have nothing to lose. Numismatic Bank, Dept. 8, Fort Worth, Texas.

ALL for 30c. A 25c California gold piece, a Premium Coin Catalog, a selling list, a Columbia nickel and a lucky seal. C. J. Carey, New Rochelle, N. Y.

OLD coins bought and sold. Full catalogue list of coins for sale, free to collectors only. Buying catalogue quoting prices. I pay 10 cents. William Henshaw, 101 Tremont St., Boston, Mass.

BUFFALO Nickels—25c each paid for them and Lincoln pennies, certain kinds. Highest prices paid for old coins. Send 10c for coin catalog and particulars. Means \$8 to you. Jones, Coin Dealer, Dept. 31, Newcom, Ill.

STAMP COLLECTING

104 DIFFERENT stamps, including United States 1861 Civil War, Japan, Argentina, etc. Large price list and sample New England Stamp Monthly, only 5c. Finest approval sheets. 50% discount. New England Stamp Company, 19 Washington Bldg., Boston.

STAMP Album with 338 Genuine Stamps, Incl. Rhodesia, Congo (Leopold), China (dragons), Tannuasia (rainforest), Jantaka (waterfall), etc., 10c. 104 diff. Jap. N. 21c., etc., 3c. Bix list: coupons, etc. Free. We buy stamps. Huseman Stamp Co., St. Louis, Mo.

24 VARIETIES Urban stamps, 10 cents. List of 6,000 low-priced stamps free. Chambers Stamp Co., 111 P. Nassau St., New York City.

FOREIGN Stamps Free! 50 different, including Pictorial Bureau; or if preferred a grand set of 7 Trichin. send 4c postage; mention Gift B197. Bright & Son, 104 Strand, London, England.

CANADA, 25 different, postage and return, 10c. 50 different, 40c. 100 different, \$1. Henson Daggin, 72 Oxford St., Toronto, Canada.

STAMPS—12 different from winning nations, 10c; 10 different foreign coins, 15c; 20 Belgium stamps, 10c. List free. Toledo Stamp Co., Toledo, Ohio.

STAMPS on approval at 50% discount. Kankakee Stamp Co., Kankakee, Ill.

STAMPS sent on approval at 10% discount. Freebooks, one-half cent each. Return required. Emory Henoff, Hanover, Pa.

STAMPS, 100, all different, free. Postage 2c. Mottin paper. Quaker Stamp Co., Toledo, Ohio.

DISCRIMINATING Collectors—Superb 50% approvals. Immense stock and variety. Free—Large packet, hinges, gauge, scarce stamps, catalogue, 2c postage. Midland Stamp Company, Midland, Ontario.

STAMPS—105 China, etc., stamp dictionary and list. 2c. Bulford, 81a, A. Boston.

PACKET of 25 stamps; no two countries alike. 500 hinges. Set of \$1 and \$2 U. S. Rev. all for 5c. Johnston paper. Midland Stamp Co., Toledo, Ohio.

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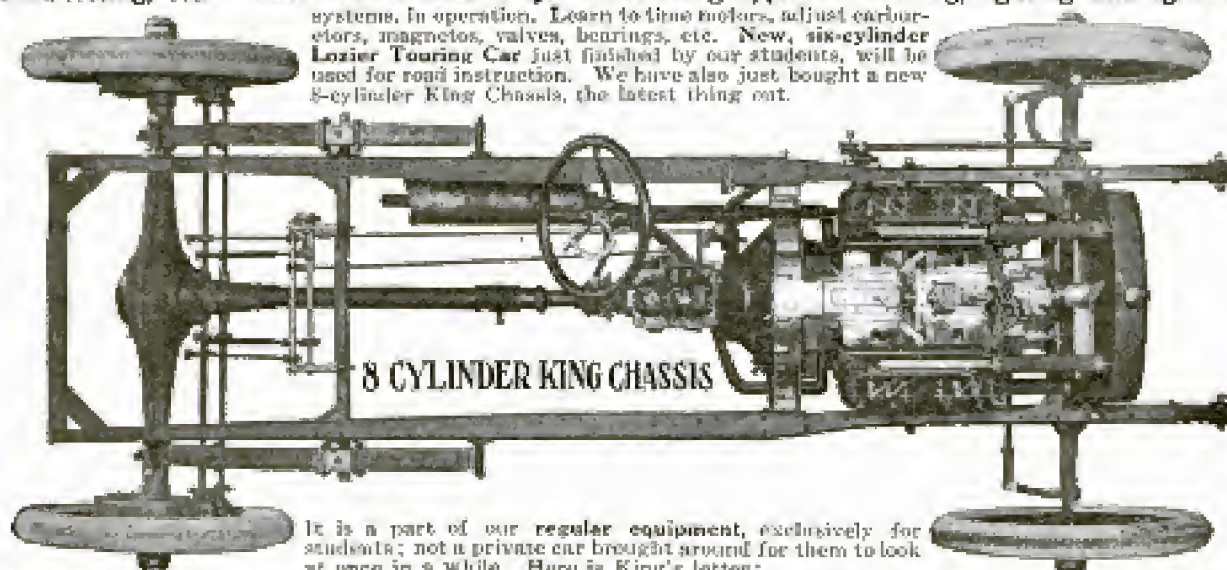
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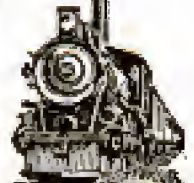
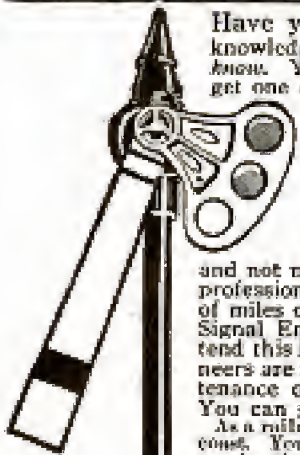
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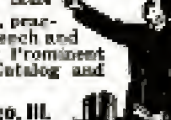
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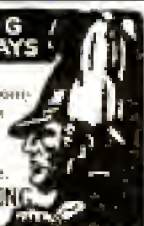
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WRITTEN SO YOU CAN UNDERSTAND IT

Vol. 23

JANUARY, 1915

No. 1

8719

New Diving Suit Gives Freedom of Motion

TO demonstrate the freedom of motion which a submarine diver has in modern diving armor, as compared with the clumsy and cumbersome apparatus generally used, a man completely equipped for underwater work recently dived, head first, from the deck of a ship, and the camera caught him in mid-air. The diving suit worn was one of the most modern type, carrying its own oxygen supply, and so making it unnecessary to have any air-tube connection with the surface. A single slender cable, carrying telephone wires and serving also to haul the diver to the surface, is the only connecting link between those on



In Modern Diving Armor the Underwater Worker Has Much Greater Freedom of Motion Than Formerly, as the Photograph Indicates

the vessel and the worker under water. Since the diving suit is not inflated, it is unnecessary to carry the heavy weights heretofore needed to enable the diver to remain under water. In depths of 40 ft. or less, which includes the levels at which nearly all submarine work is done in harbor and dock construction, the new type of suit has many advantages over those now in use.

8528—

TWO-SPOOL SEWING MACHINE DISPENSES WITH BOBBIN

A lock-stitch sewing machine which has no bobbin, but instead uses two standard spools of thread, one of them



The Shuttle of This New Sewing Machine Carries a Whole Spool of Thread Instead of a Bobbin

carried in the shuttle in the same way a bobbin is used, has been developed and is being marketed by one of the large sewing-machine companies. Among the advantages claimed for it are simplicity and ease of operation and the fact that, when two spools of the same size are used, the upper spool serves as a gauge to indicate the amount of thread remaining in the shuttle. The time saved over winding bobbins is also a consideration.

FLOATING GATE FOR PANAMA CANAL LOCKS

A floating caisson gate that is believed to be the largest of its kind ever built has been completed at San Francisco and towed to the Panama Canal, where it is to be used, when required, as a dam across the entrance to any of the locks when the gates are to be repaired or painted, or when a lock is to be unwatered for any reason.

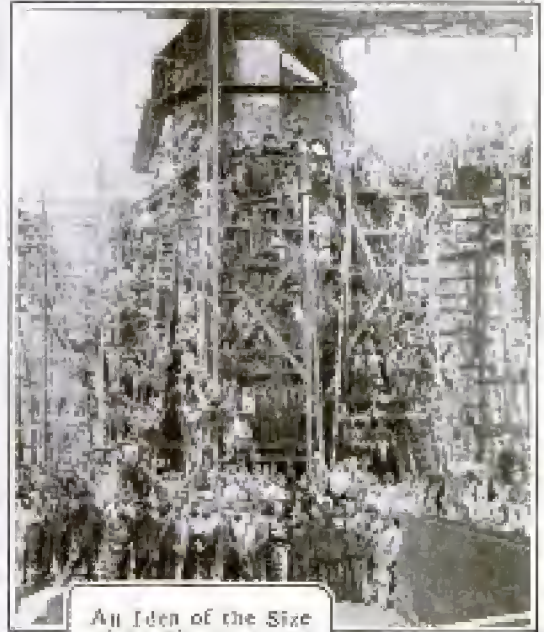
The voyage consumed 43 days. Rough weather, in connection with the unusual height of the caisson, made its towing difficult. The seamen aboard the caisson deserted at the first port and the voyage was completed without a crew.

The caisson is built of steel and is 113 ft. 10 in. long, 66 ft. deep, and has a molded breadth of 36 ft. Its light draft is 32 ft., and its maximum draft when in service, 62 ft. The keel is horizontal and the ends vertical, the gate being designed, when resting on the bottom of the lock, to make a water-tight dam fitting between cast-iron plates fixed to the masonry of the lock walls. The caisson is equipped with a powerful pumping plant that is to be used in unwatering the locks as well as in raising or lowering the caisson, by decreasing or increasing the amount of water in the water-ballast compartments. The pumping plant consists of four pumps, each driven by a 225-hp. electric motor and capable of discharging an average of 13,000 gal. a minute. The piping system in connection with each pump is arranged to permit suction or discharge to take place on either side of the caisson, as required. The electric current is supplied from power cables installed within the lock walls, and the motors, therefore, cannot be operated except when the caisson is placed in working position at one of the locks, or when it is moored at a station in Gatun Lake or Miraflores Lake. The building of the caisson required 1,500 tons of structural steel, and 800 tons of permanent ballast was placed in the bottom to stabilize the caisson when in light-draft condition.

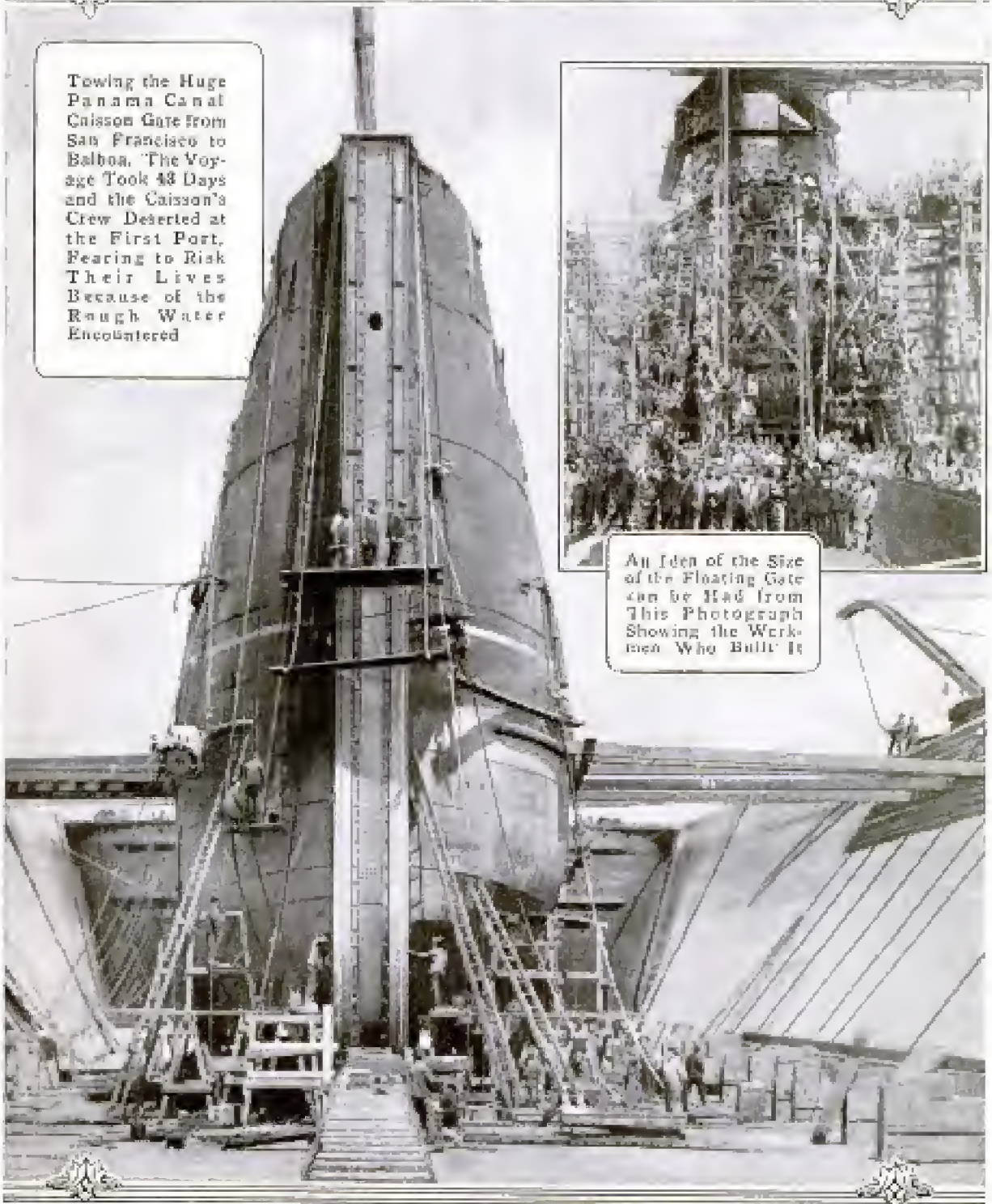
National Sewing Machine Co.
Belvidere, Ill.
Chicago Office 320 W. Madison St.



Towing the Huge Panama Canal Caisson Gate from San Francisco to Balboa. The Voyage Took 43 Days and the Caisson's Crew Deserted at the First Port, Fearing to Risk Their Lives Because of the Rough Water Encountered



An Idea of the Size of the Floating Gate can be Had from This Photograph Showing the Workmen Who Built It

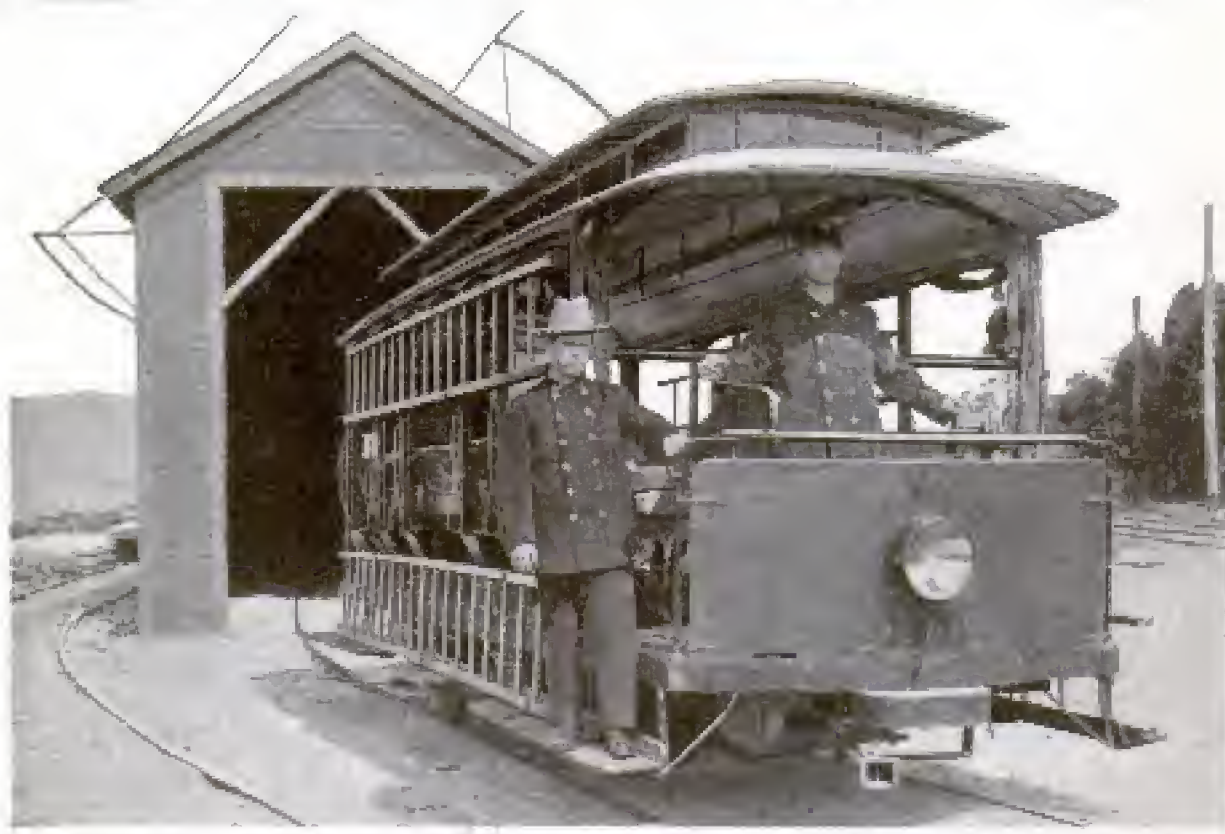


Steel Floating Gate, 60 Feet High and 36 Feet Wide, Built at San Francisco

for the Panama Canal

Pacific Photo News Service
1303 1/2 Waller St., San Francisco, Calif.

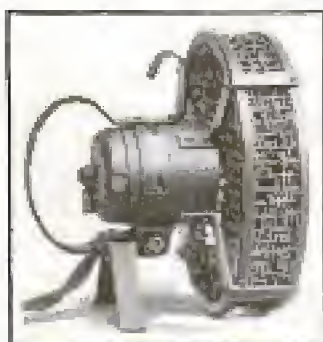
Built by Union Iron Works,
San Francisco



Trolley Car Equipped for Fire Fighting Which Gives Efficient Service in a Suburb of Duluth

SLEEPING CARS TO HAVE FAN 8078 FOR EACH BERTH

A compact and portable electric fan for sleeping-car berths, now being introduced, is operated by the current used for lighting the car. The blades are inclosed in a light but substantial woven-wire guard, so that it is impossible for the fan to cause injury



to the passenger or damage to the car fittings. The fan is designed to be hung up in the berth, and measures but $4\frac{1}{2}$ in. in diameter over all.

According to present plans, the Japanese government will not build any new battleships for a year, but will provide for the construction of submarines and torpedo-boat destroyers for defensive purposes.

FIRE-FIGHTING TROLLEY CAR 8597 USED IN DULUTH

A novel idea in fire-fighting apparatus which has been adopted by the city of Duluth, and which might be successfully applied in almost any community having electric street-car lines, is a trolley car equipped with fire-fighting tools. In a certain section of the city the sandy streets make it difficult for the fire department to answer an alarm quickly, so a small fire station was erected near the traction company's car barn. An old trolley car was purchased and equipped with hose, ladders, chemical extinguishers, axes, lanterns, and all the other necessary apparatus for extinguishing small fires and preventing them from becoming large conflagrations. The gong on the car is operated by an electric battery which keeps it ringing continuously when the car is in motion. The regular crew of the trolley consists of a motor-man and one city fireman. With this service it is rarely necessary to call for additional fire-fighting forces.

Fred H. Weinberg
90 Duluth News-Tribune
Duluth, Minn.

Westinghouse Electric & Mfg. Co.
Pittsburgh, Pa.

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**All the Warring Nations have Agreed to Them, but There Is No
8301 International Umpire to Enforce Them**

THE rules of war are as sharply defined, as clearly formulated and as generally recognized as the rules of football, baseball, cricket, or the prize ring.

No flippancy is intended in this comparison of war with sport. For countless centuries war was, in fact, almost the only sport indulged in by the male members of the human race. Even to-day there may be found in every nation those who maintain that it is the only sport worth a real man's while—in some nations this view is still the dominant one. And just as other sports have developed rules by which the players are bound, so have the rules of war developed. The only important difference is that in the game of war there is no umpire or referee with power to enforce his decisions, and consequently the rules may be, and often are, violated.

In the beginning of things and down to very recent times indeed, there were no restrictions, definite or implied, upon the rights of a commanding gen-

eral or the powers of his army. They might—and did—pillage and loot and burn and destroy as, and when, they pleased. No man, woman or child owing allegiance to the enemy had any rights which a hostile force was even morally bound to respect. "Leave them neither root nor branch," was the universal rule of war. As mankind reached a higher stage of civilization, war gradually became more humane—or, rather, less barbarous. Acts that had always been recognized not only as the right, but almost as the duty, of armies in the field came, century by century, to be regarded as at least unsportsmanlike. It was not until the Civil War in America, however, that any nation undertook to formulate, codify, and publish a set of rules for the guidance of those who play the game of war. In 1863, the war department of the United States issued a manual of the laws governing civilized warfare—a manual which, brought down to date, forms part of the equipment of every officer in the United States Army. A



At Night When a Hospital Ship is Making for Port with Wounded Aboard, it is Usually Identified by the Crimson Geneva Cross Illuminated on Its Sides, in Addition to the Green or Red Stripe Specified in The Hague Conventions. The Rules of War Afford These Vessels Protection

year later an international conference was held at Geneva, Switzerland, and the conventions signed there by all the great powers, relating to the care of the sick and wounded, were the first internationally formulated rules of war. Several other conferences followed this one, but the formal "regulations respecting the laws and customs of war on land," which are in force today between the warring nations of Europe, were drawn up and agreed upon at the first and second Hague conferences, held in 1899 and 1907.

Under these rules a declaration of war must be made before hostilities are begun. As soon as a state of war exists all neutral nations must be notified, and until then they cannot be held responsible for acts in violation of their neutrality.

The first rule governing war on land prescribes that "the laws, rights and duties of war apply not only to armies, but also to militia and volunteer corps fulfilling the following conditions: To be commanded by a person responsible for his subordinates; to have a fixed distinctive emblem recognizable at a distance; to carry arms openly, and to conduct their operations in accordance with the laws and customs of war. In countries where militia and volunteer corps constitute the army or form part of it, they are included under the denomination 'army.'" Persons not coming under this provision and who take up arms in violation of the rules of war are entirely without rights.

The rules regarding prisoners are very clearly defined. In case they are captured by an enemy, both combatants and noncombatants who have followed military customs are prisoners of war and must be treated accordingly. They are within the power of the hostile government only, not that of their individual captors, and must not be deprived of personal property other than that suitable for the operations of war, such as horses and arms. Excepting in the case of officers, the controlling state has the power to utilize the labor of its prisoners, but this must be paid for in accordance with the wage

scale in force in the country where they are held, although the cost of their maintenance may be deducted. The work demanded must not be excessive nor pertain to military affairs.

If a prisoner escapes and is recaptured, he is subject to disciplinary treatment, but if he is able to make good his escape and rejoin his army he is not liable to punishment if subsequently retaken. When a captive is paroled he is bound by his honor and that of his state not to reënter the war, and should he later be captured carrying arms he would be subject to court-martial. Each belligerent nation at the opening of a war must establish an inquiry office for prisoners, the function of which is to answer all inquiries made concerning them. These offices enjoy free postage privileges, and mail dispatched to prisoners is exempt from duty. While they are incarcerated, prisoners must be allowed freedom of religion and attendance at whatever church they belong to.

Stringent rules forbid the use of either poison or poisoned weapons. Any method of inflicting injury upon an enemy which might be construed as a treacherous act is absolutely prohibited, just as it is to kill or wound a man who has laid down his arms, or is without means of defense. It is a direct violation of the code to refuse to give quarter, "to employ arms, projectiles, or material calculated to cause unnecessary suffering, or to use improperly the Geneva cross, the flag of truce, or the uniform of an enemy." Under this restriction come dumdum bullets, expanding projectiles, gas bombs, saw-toothed bayonets, and similar things, of which much complaint has been made to neutral nations during the present war.

Warning, in all cases except in repulsing an assault, must be given by the commander of an attacking force before he orders the bombardment of any town, and even then every precaution must be taken to prevent the destruction of public buildings dedicated to art, science, religion, or charitable purposes. Under no circumstances is



Above Are Specimens of Dumdum Bullets Which the Germans Claim were Taken from the French in Belgium, While at the Right Is a Similar Projectile Shown to the State Department by the French Ambassador at Washington and Said to have been Found with Others in the Possession of German Soldiers. Such a Bullet Expands upon Striking a Body and Produces a Ghastly Wound. Its Use is Prohibited by the International Rules of War

pillaging allowable. Undefended towns must not be bombarded, nor their dwellings or buildings burned so long as their inhabitants observe the rules of war.

Spies are carefully defined, and in punishing a man as such the rules must be followed implicitly. The code declares that "a person can only be considered a spy when, acting clandestinely or on false pretenses, he obtains or endeavors to obtain information in the zone of operations of a belligerent, with the intention of communicating it to the hostile party." Thus, soldiers in their proper uniforms, not wearing a disguise, who have penetrated into the zone of operations of a hostile army, for the purpose of obtaining information, are not considered spies. Similarly, soldiers and civilians, carrying out their missions openly, who have been intrusted with the delivery of dispatches intended either for their own or for the enemy's army, are not to be treated as spies. To this class likewise belong persons sent in balloons for the purpose of carrying dispatches and, generally, of maintaining communications between the different parts of an army or a territory. A spy must have a fair trial before being punished. A man known to have operated as a spy, or who has escaped after capture, must not be punished nor treated otherwise

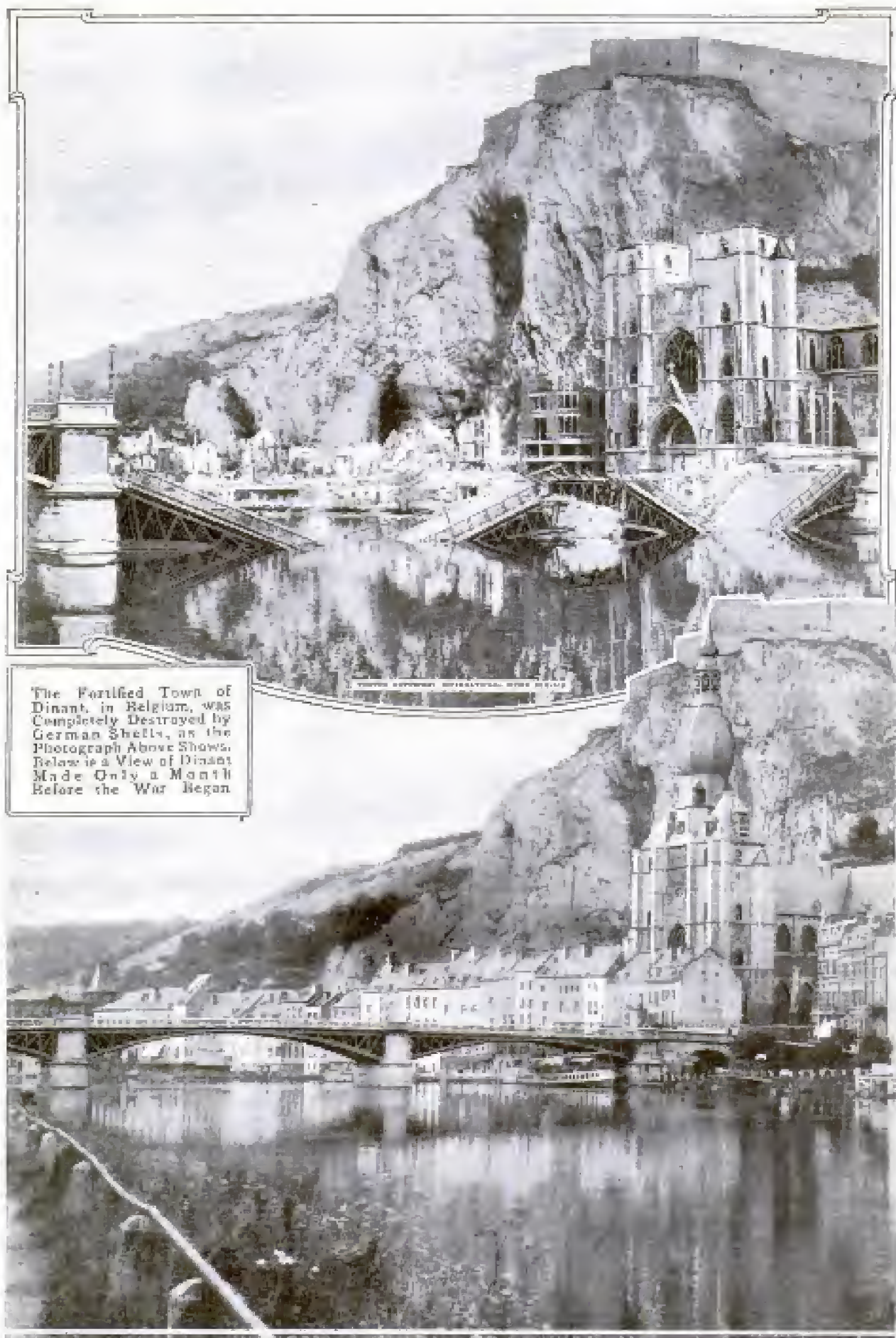


German Soldiers are Charged with Using Saw-Tooth Bayonets, Forbidden by the Rules of War

than as a prisoner of war if captured after having rejoined his army.

As has been customary from remote times, an army under the modern rules still has a right to live off the country of an enemy. It is only when a territory is completely under the authority of a hostile power, however, that it can be considered as occupied. While an invading army must observe the laws in force in the country it occupies, it has a right to impose and collect taxes. Such moneys can be used only for defraying the expenses of administration and for the maintenance of the army actually within the district affected. It is not allowable to impose a general fine for acts of which the population as a whole is not responsible.

All requisitions made for the needs of an army must be proportioned to the resources of the city or territory drawn upon. The seizure or willful injury of



The Fortified Town of Dinant, in Belgium, was Completely Destroyed by German Shells, as the Photograph Above Shows. Below is a View of Dinant Made Only a Month Before the War Began.

Under the International Rules of War the Destruction of This Little City on the Meuse was Entirely

public buildings is prohibited, and if such acts are committed, restitution may be asked of the courts. "Family honor and rights, the lives of persons, and private property, as well as religious convictions and practice, must be respected," the rules declare, in the military administration of a hostile territory.

The modern rules of war make the territory of neutral nations inviolable, and belligerents are forbidden from moving troops, munitions of war, or supplies through such a district, or to erect within its confines a radio station, or other apparatus of communication, for the purposes of war.

The rules laid down in the Geneva convention, which were incorporated at

The Hague conferences, make it mandatory that the sick and wounded in war be treated without distinction as to nationality. Those falling into the hands of an enemy become prisoners of war and must be treated as such. The army in possession of a field at the close of an engagement must search for the wounded and provide for their relief, while each belligerent is bound to communicate to its government, as quickly as possible, descriptions of possible marks of identification on the bodies of the dead, as well as the names of the wounded taken. Belligerents must notify each other of interments, transfers, admissions to hospitals, and deaths of each other's men.

Hospital and ambulance equipment



Justified. Any Fortified Town Is a Legitimate Object of Attack After Due Notice has been Given

and all other sanitary formations of an army, and the personnel attached to them, must be considered neutral and be protected by an enemy. In case a surgeon, or other member of the sanitary staff, falls into the hands of hostile forces, he cannot be deemed a prisoner of war, but must continue his work under the direction of his captors. If mobile sanitary formations are taken by an enemy, they must be kept intact; that is, for instance, horses attached to an ambulance must not be used for other purposes. When either the personnel or equipment is absolutely needed by the army to which it originally belonged, they must be returned.

The rules governing the care of the wounded on land apply in most respects to naval warfare. Hospital ships for the most part are considered neutral, and the rule applying to warships in neutral ports does not restrict them. Military hospital ships, meaning those fitted out and operated by a belligerent government, are distinguished by being painted white and having a green stripe, about a yard and a half in breadth, running from stem to sternpost of their hulls. Hospital vessels fitted by officially recognized relief societies bear a red band about their sides, while both kinds fly the Geneva flag and that of the country under which they are operating. At night, these ships are identified by a crimson Geneva cross, brightly illuminated, on their sides. They must afford relief to all wounded and shipwrecked men alike, may be searched by a belligerent, directed to take a new course, or even, in extreme cases, be temporarily detained, but their staffs must be respected and cannot be made prisoners. If wounded men are taken aboard a neutral warship, they must not reënter the conflict.

The rules regulating marine warfare prohibit the laying of unanchored automatic-contact mines unless they are so constructed that they will become harmless within one hour after they are uncontrolled. The use of torpedoes which remain dangerous in case they miss their target is also forbidden.

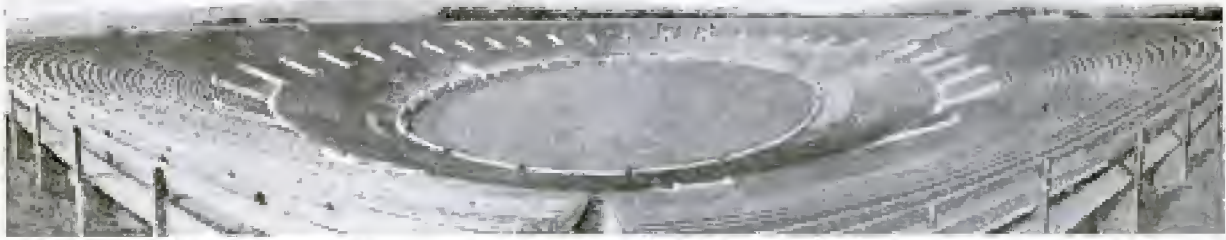
In no case can mines be laid off the coast of any country solely for the purpose of stopping commercial shipping, while all mines must be removed at the end of the war.

Naval bombardment of ports is governed by rules similar to those regulating land operations, prescribing that undefended places shall not be shelled, and that in all instances warning must be given previous to firing. The fact that a harbor is mined does not change the classification of an otherwise unfortified place. If the authorities of such a city, however, violate the rules of warfare by refusing to honor requisitions for food or supplies, which must be made according to the resources of the place, its bombardment is then allowable, but public buildings of the protected class must be spared injury so far as it is possible to do so.

Mail, either private or official, belonging to any nation and found on the high seas, is inviolable. Belligerent warships are not permitted to commit any act of hostility in neutral waters, and, except in extreme cases, must not remain for more than 24 hours in a neutral port. When coaling at such a port, a battleship is allowed only enough fuel to carry it to the nearest port of its own country, after which it is not again allowed the privilege for three months.

Those are the main provisions of the modern rules of warfare. Their details would take many pages to tell. With a few unimportant exceptions every one of the nations involved in the European conflict has solemnly pledged itself to observe these rules. When the war is over, should the victorious nation or nations be able to establish conclusively that the other side in its operations violated any of these fundamental rules, it may mete out punishment for such offenses almost as it pleases. But thus far there is no international tribunal to which a vanquished nation can appeal for justice. A victory won by violating the rules of war is still a victory—there is no referee with power to award the decision on a foul.

Underwood & Co. 12-14 W. 37th, New York



Yale's New Stadium Which Seats 61,000 Persons

YALE'S NEW STADIUM SEATS

8573 SIXTY-ONE THOUSAND

The largest seating capacity of any permanent structure in the world is claimed for the new athletic stadium of Yale University at New Haven. Sixty-one thousand persons can be seated in this huge structure, which cost \$450,000 to build. It was used for the first time for the Yale-Harvard football game on Nov. 21, 1914.

TWENTY-TON ROCK ROLLS

8619 INTO PASSENGER TRAIN

A rock weighing 20 tons rolled half a mile down the side of a mountain, gathering speed and force as it rolled, until it was traveling almost with the energy of a shell from a 42-centimeter howitzer. It struck a passenger train in the cañon 20 miles east of Grand Junction, Colo., killing three men, smashing its way clear through the car and rolling into the Grand River. A second rock, a little less than half the size, followed the trail of the first one, dropped upon the smoking compartment of the car behind and remained imbedded there as shown in the photograph. No one was killed in this car.

NOVEL MONUMENT OF PRINCE

8366

BISMARCK

One of the most curious monuments in the world is that of Prince Bismarck at Cologne, Germany. This monument is built up of brick and in this and in architectural treatment resembles the memorial of the "Battle of the Nations" erected at Leipzig in 1912. The monument carries a figure of heroic size, representing the great chancellor. The peculiar and somewhat archaic treatment of the figure has excited much conjecture. The monument has been likened to the Sphinx of Egypt. It was finished just as the present war began.



Left to Right: Car Struck by Nine-Ton Rock; the Rock in the Car; Where a 20-Ton Rock Killed Three

D. & R. S. R. R.

Harry L. Wohlfort, Grand Junction, Colo.

J. W. Everett, Sheffield, Bradford, York, Eng.

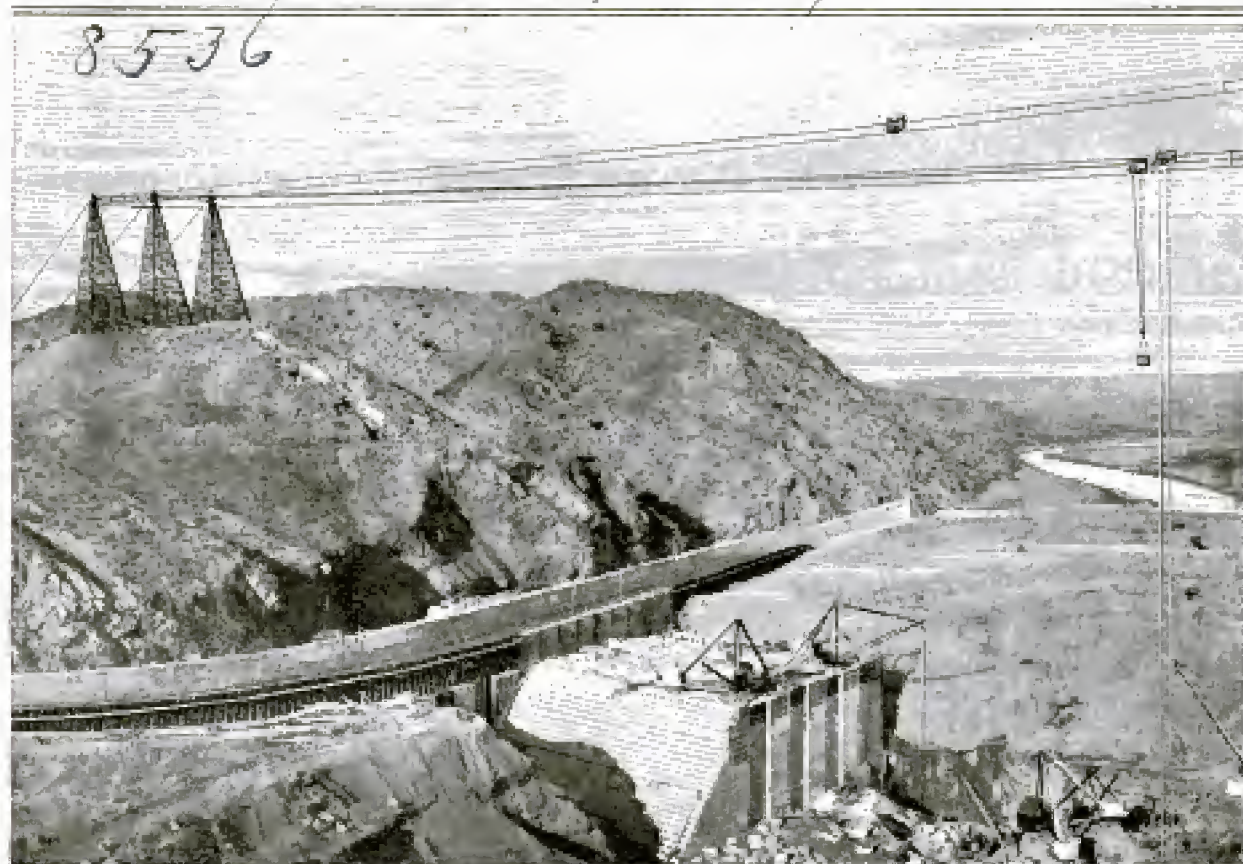
John Tait
703-H Western Union Bldg, Chgo.

12

POPULAR MECHANICS

See Oct '16 - 840 #3170

8536



GREAT ELEPHANT BUTTE DAM APPROACHING COMPLETION

Next May the formal "opening" of the Elephant Butte dam, the biggest irrigation project ever undertaken by the Reclamation Service of the United States, will be celebrated by all New Mexico and Texas. President Wilson has signified his intention of attending the ceremonies if possible.

With the exception of the Nile dam at Assouan, Egypt, this is the largest irrigation dam ever built. It will contain, when finished, 550,000 cu. yd. of solid masonry. This is mainly concrete with up and downstream faces cast against forms.

When completed, the big dam will be 1,200 ft. long on top at an elevation of 4,414 ft., which is 200 ft. above the elevation of the original river surface. The maximum height from the deepest excavation to the top of the parapet wall will be 304.5 ft. The maximum base width is 215 ft. It will form a lake in the Rio Grande Valley averaging $1\frac{3}{4}$ miles wide, 66 ft. deep, and

with a shore line of 200 miles. The lake will cover 42,000 acres and contain 862,200,000,000 gal. of water.

This enormous volume of water will be stored above the dam, to be released as required for irrigating 155,000 acres of land. As it is released a hydroelectric plant will transform the fall into electricity for general use by the settlers in the irrigated district. Dam, hydroelectric plant, and all, will become the property of the settlers when the nominal water tax has repaid the government the cost of construction.

In building the dam, the government engineers have used a system of three cables, each of 15-ton capacity with a span of 1,400 ft., suspended from towers 125 and 80 ft. high, respectively, and at elevations of 4,414 and 4,483 ft., the cables having 80 ft. sag, and being operated by double-drum, 300-hp. engines with a running speed of 800 ft. and a hoisting speed of 200 ft. per minute.



Building the Elephant Butte Dam in New Mexico, the Largest Irrigation Dam in America. It will impound 563,200,000,000 Gallons of Water. The Cables Have a Span of 1,400 Feet

The concrete-mixing plant is 24 ft. by 40 ft. and 12 ft. high. Each of the three 80-cu. ft. mixers turns out 43 batches of concrete per hour, each batch containing 75 cu. ft. and weighing $31\frac{1}{2}$ tons. Two 100-hp. motors drive the stone-crushing plant, with a capacity of 140 tons an hour. For hauling rock and supplies, the government has built 12.82 miles of standard-gauge railway, 3.67 miles of which is double-tracked. Four 16-ton locomotives are required in the work.

7986 MARK STORE'S ANNIVERSARY WITH BIRTHDAY CAKE

In marking the third anniversary of its existence, a San Diego, Cal., department store displayed over its entrance a birthday cake measuring 12 ft. in diameter, which, although made principally of wood, bore almost the appearance of being genuine. It was thickly coated with what, from the sidewalk, seemed to be white frosting, while festooned around its sides were chains of pink buds. In the top of the

cake were three candles. Yellow cloth in these, cut to represent tongues of fire, so wavered in the breeze that it made the candles look as if they were lighted.



Realistic Artificial Birthday Cake Used to Mark the Third Anniversary of a San Diego, California, Store

Donald S. Rockwell
Ocean Beach, Calif.

NEW FLYING BOAT IS BUILT FOR ARMY AERIAL CORPS

A new flying boat of the Burgess-Dunne type with a bullet-proof cockpit has just been completed for the



New Flying Boat Built around a Special Motor
for the Army Aerial Corps

army aerial corps. The craft was especially designed for, and built around, a \$14,000, nine-cylinder, Sampson motor which the government purchased some time ago in France, and is said to be the largest and fastest machine so far built for military purposes in this country. The engine, which is capable

of developing between 120 and 130 hp., gives the craft a speed of about 90 miles an hour and is accredited with having exceptional lifting power. The cockpit is so designed that the pilot and other occupants are practically hidden from view when flying, while the floor is supplied with a $\frac{1}{8}$ -in. nickel-steel plate, made by the government, which is able to resist rifle projectiles. The propeller blades are of peculiar shape, while in several other technical details the machine differs from previous models.

8588

WIRE SUSPENSION BRIDGE ACROSS SPEEDWAY

A frail-looking and yet substantial suspension bridge, having a span of about 80 ft., runs from the grandstand of the Indianapolis motor speedway to a braced support on the opposite side of the track. Two small strands of wire cable form the main support, from which are hung hangers at 3-ft. intervals carrying light cross joists on which longitudinal floor planking is laid.

The bridge serves not only to enable employes and officials to cross the speedway in safety, but provides a point from which starters and judges may observe the races and signal the contestants.



Wire Suspension Bridge across a Motor Speedway

Shoo. E. Harika
17 Aetna Bldg, Indianapolis, Ind.

Burgess Co.
Hartford, Conn.

A SUBMARINE-AEROPLANE-WIRELESS SYSTEM OF SEACOAST DEFENSES

[This article is based on suggestions made by an engineer who enjoys a high reputation in his profession by reason of his scientific ability and many important inventions, but who requested that his name should not be published in this connection: There is much food for thought in the simple and practical idea which he has brought forward.—Editor.]

THE European war has turned the thoughts of the American public toward the question of national defense more sharply than at any time since the early days of the republic. Our tremendous coast lines on the two oceans offer almost countless opportunities for attack from the sea. While the more important strategic points and the entrances to the harbors of the great seaboard cities are guarded by coast-defense batteries, yet there are still many places at which an enemy could land troops, and there is always the chance, as has been demonstrated in every recent war, of a successful naval attack even against such great guns as those which guard the harbors of Boston, New York, Philadelphia, Baltimore, and San Francisco.

The submarine has demonstrated its paramount value as a naval weapon of offense and defense; the aeroplane has proved its worth as a means of detecting the approach of an enemy whether by land or sea; the wireless has developed into a ready and invaluable means of communication. A navy adequate to guard our 3,000 miles of coast line against any possible attack would have to be of such proportions as almost to bankrupt the nation to pay for it. Any navy the United States can afford to maintain would have to be so scattered as to its units, if the effort were made to protect the entire coast, that the inevitable result would be to furnish adequate protection nowhere. Why not, then, rely more upon the submarine, the aeroplane, and the wireless, and less on the battleship? It would be feasible from every engineering and military viewpoint, and practical at a financial cost certainly not much more than half the sum which has already been spent on the navy and coast defenses, to protect every mile of coast on both oceans against any possible attack from the sea.

Let the Atlantic and Pacific coast be divided into 10-mile sections, measuring along the main contour and disregarding the minor bays, headlands and inlets. At each 10-mile point let there be erected a wireless tower of a height and capacity sufficient to enable it to communicate a minimum distance of, say, 500 miles. Let this wireless tower, or rather the spot at which it is located, serve as the base and harbor for one submarine and two scouting, bomb-dropping aeroplanes; the aeroplanes and submarines all to be equipped with means of wireless communication. On the towers searchlights might also be mounted, and they could likewise be utilized as lighthouses or landmarks for mariners, as well as stations for the coast-patrol and life-saving service.

With 300 such wireless-submarine-aeroplane coast-defense stations in constant communication with each other, no hostile fleet could approach our shore from any direction without being discovered and its exact position noted and reported back by the aeroplane scouts. Even if they found no opportunity to drop bombs on the advancing warships, they could guide the submarines to the attack. Long before the enemy's smoke were visible, 50 miles out at sea, the submarines from 20 stations would be converging toward the hostile ships. The air would be filled with aeroplanes whose pilots could direct the movement of the submerged craft with unerring accuracy. Before the watchers on shore could get a glimpse

of the hulls of the invaders, only a rare combination of chances could prevent the entire fleet from being sunk.

Should all or most of the units of the attacking fleet succeed in evading the submarine attack, fields of mines, placed by mine patrols working from each 10-mile base and sown so thickly as to form a continuous cordon along the shore, would serve as a further and final defense. These might be contact mines, or electrically connected to the shore stations. By the time such a scheme of defense could be put into operation, however, there is little doubt that means of controlling and exploding mines and torpedoes by wireless impulses will have been perfected. Indeed, if the results already known to have been achieved in Europe by Torres y Quevedo, and in this country by John Hays Hammond, Jr., in controlling vessels by wireless impulses from a distance, are taken into consideration, it is not a wild dream to predict that the submarines involved in this project could be operated without crews, being steered and their torpedoes discharged by the operators in the wireless towers, acting under the direction of the expert officers in the aeroplanes. There is reason to believe that our war department, under whose patronage and direction Mr. Hammond has been working, already possesses the secret of this means of wireless control.

What would it all cost? All the necessary construction and equipment for the wireless towers could be done for \$10,000 apiece or less—say \$3,000,000 in all. Three hundred submarines would cost, at the rate paid for the latest submersible models built for our navy, \$150,000,000, or \$500,000 apiece. It is entirely probable, however, that this cost could be very greatly reduced, perhaps as much as one-third, were their construction to be undertaken on such a wholesale scale. Navy flying boats of the most modern type are worth \$12,000 each. Six hundred of them would cost \$7,200,000 at this rate. Estimating the average cost of the necessary buildings, quarters, hangars, harbors for the submarines, etc., at each station, at \$100,000, here is another \$30,000,000. An investment of \$200,000,000 at the outside would protect our coasts. That is \$2 for every man, woman, and child in the United States—surely cheap protection at the price. Suppose the cost of maintenance, for men, supplies, renewals and repairs, were as much each year as the original cost—what of it? One-fifth or less of our annual national revenue is not too high a price to pay for protection. The army and navy appropriations in 1914 were \$251,515,629.11. The naval vessels now in commission represent a total investment of more than \$400,000,000. If even double that sum would insure our national safety, who would begrudge it?

8571

PERRY'S VICTORY MEMORIAL A GREAT DORIC COLUMN

To commemorate Commodore Oliver Hazard Perry's victory over the British fleet in the naval battle of Lake Erie on Sept. 10, 1813, the Interstate Board of the Perry's Victory Centennial Commissioners, appointed by the President of the United States and the governors of 10 states, authorized the erection of a monument at Put-in-Bay,

South Bass Island, Ohio. The monument, which has just been completed, is in the form of a great Doric column of pink Milford granite, 317 ft. 3 in. high, surmounted by a gigantic bronze tripod and light, 22 ft. 10 in. high, a total height of 340 ft. 1 in. The column is 45 ft. in diameter at the base, and 35 ft. 6 in. at the neck, while the abacus



Doric Column, 340 Feet High, Erected at Put-in-Bay to Commemorate Perry's Victory on Lake Erie



The Huge Bronze Tripod on Top of the Perry Memorial is Seventeen Feet Four Inches in Diameter, Weighs Ten Tons, and Cost \$13,000

at the top is 47 ft. square. The walls are 9 ft. 9 in. thick at the base and 4 ft. at the neck. The tripod, of statuary bronze in wrought and cast sections, is 17 ft. 4 in. in diameter. Its glass dome is an unbroken surface with closed joints, a form of construction never before attempted in glass. The tripod weighs approximately 10 tons and cost \$13,000, while the total cost of the column was \$395,000.

The names of the Americans killed and wounded in the battle of Lake Erie, Sept. 10, 1813, will be carved in the wall panels of the rotunda of the column, and the complete roster of the fleet will appear in bronze tablets on the second floor. A passenger elevator will run to the spectators' gallery, at a height of 317 ft. The memorial reservation of 14 acres, from the center of which the column rises, comprises the narrowest part of Put-in-Bay Island toward East Point, overlooking in either

direction from the site of the column, within a distance of about 300 ft., the waters of both Lake Erie and Put-in-Bay Harbor. The scene most appropriately includes Gibraltar Island, West Sister Island, off whose shores Commodore Perry dispatched his famous message, "We have met the enemy and they are ours;" the Canadian shore, the expanse of waters, and the international boundary line.

Owing to the growing use of the parcel post by farmers for shipping various products direct to the consumer, it has become necessary to install refrigerating systems in the larger post offices of the country in order to prevent the loss of perishable goods which are occasionally delayed in delivery. Arrangements have been made for the installation of storage refrigerators at New York, Chicago, and other cities.

8662 THE OUTBREAK OF FOOT AND MOUTH DISEASE

THE seriousness of the epidemic of foot and mouth disease in cattle, which spread rapidly over the Middle West in the autumn of 1914, was only realized generally when the Chicago stock yards were closed on November 6, and orders were given to kill hundreds of head of cattle and hogs and to disinfect every foot of the yards. The disease appeared about October 9 on a farm near Niles, Mich. Vigorous steps were taken to stamp it out, but the infection had already been carried by a shipment of hogs to the Chicago stock yards and from there scattered broadcast through shipments of "feeder" stock. Following this the Federal government took charge. During the epidemic of 1902 a corps of inspectors had become experienced in detecting the disease and in dealing with it. These were summoned by wire from all parts of the country, and within three days the government had a full force at work fighting the epidemic in every section where the symptoms appeared.

At the Chicago stock yards alone



Thousands of Pigeons, That had Made the Chicago Stock Yards Their Home for Years were Killed to Prevent Them from Spreading the Foot and Mouth Disease



For Disinfecting the Yards, a Five-Per-Cent Solution of Cresol was Sprayed over Every Surface and in Every Corner by a Compressed-Air Machine



Fumigating the Photographer Who Made These Pictures



View of a Section of the Chicago Stock Yards at the Time the Quarantine against Foot and Mouth Disease Went into Effect. All the Cattle Then in the Pens were Killed to Stop the Spread of the Disease



Burying the Carcasses: The Trenches were Filled with Quicklime before being Covered Over with Earth



Sending In Food to Employees Quarantined in the Yards

912 head of cattle, valued at \$52,000, and 160 hogs, valued at \$2,200, were killed, and a war of extermination was carried on against the rats with which portions of the yards were infested, and also against the pigeons that had made the yards their home for years. The work of cleansing the yards of every trace of the disease was prompt and thorough. One thousand men were sent into the yards, and the infected animals were killed and buried in quicklime. By November 9 not an animal, with the exception of some of the fine stock that had been exhibited at the dairy show, was left in the yards, a situation that had never existed since they were opened in 1865. As fast as the animals were killed and buried the yards were cleaned, and 21 compressed-air spraying machines were set to work disinfecting the fences, gates, feed troughs, pavements, and alleys with a five-per-cent solution of cresol, and, following this, quicklime was scattered over every surface and in every corner where there was a possibility that infection had found lodgment. Some of the dairy-show animals were found to be infected, but few if any of these were killed, since the disease is not necessarily fatal, but its treatment is such that it can only be undertaken in the case of unusually valuable animals. One of the animals treated was an Ayrshire bull valued at \$10,000.

The foot and mouth disease has visited this country only twice before in the past 30 years. The outbreak of 1902 was the most severe and was confined to Massachusetts, Rhode Island, New Hampshire, and Vermont. It began about December 1 and lasted until the following May. In that time, 4,461 head of stock were killed, the total cost of the outbreak amounting to about \$300,000. The cause of the disease is a microbe too small to be seen with a microscope, which passes readily through the pores of a porcelain filter. The period of incubation of the infection is from a few hours to two or three days, so that, once started, the disease spreads rapidly. The first symptom is frothing at the mouth. The

animals may also be heard smacking their mouths, this being caused by soreness and ulcers. At the same time, they develop stiffness in the legs which is caused by soreness in the feet. Horses and mules are not affected.

The disease may be transmitted to human beings, usually through the use of infected milk, meat, or butter. Although it is not so severe as with animals, it is serious enough to require the closest attention. In one epidemic, in Germany, many persons died as the result of pneumonia, Bright's disease, and general wasting that followed foot and mouth disease. The microbes are easily destroyed by heat. Ordinary cooking kills them in infected meat, while pasteurization at 140° F. makes milk entirely safe.

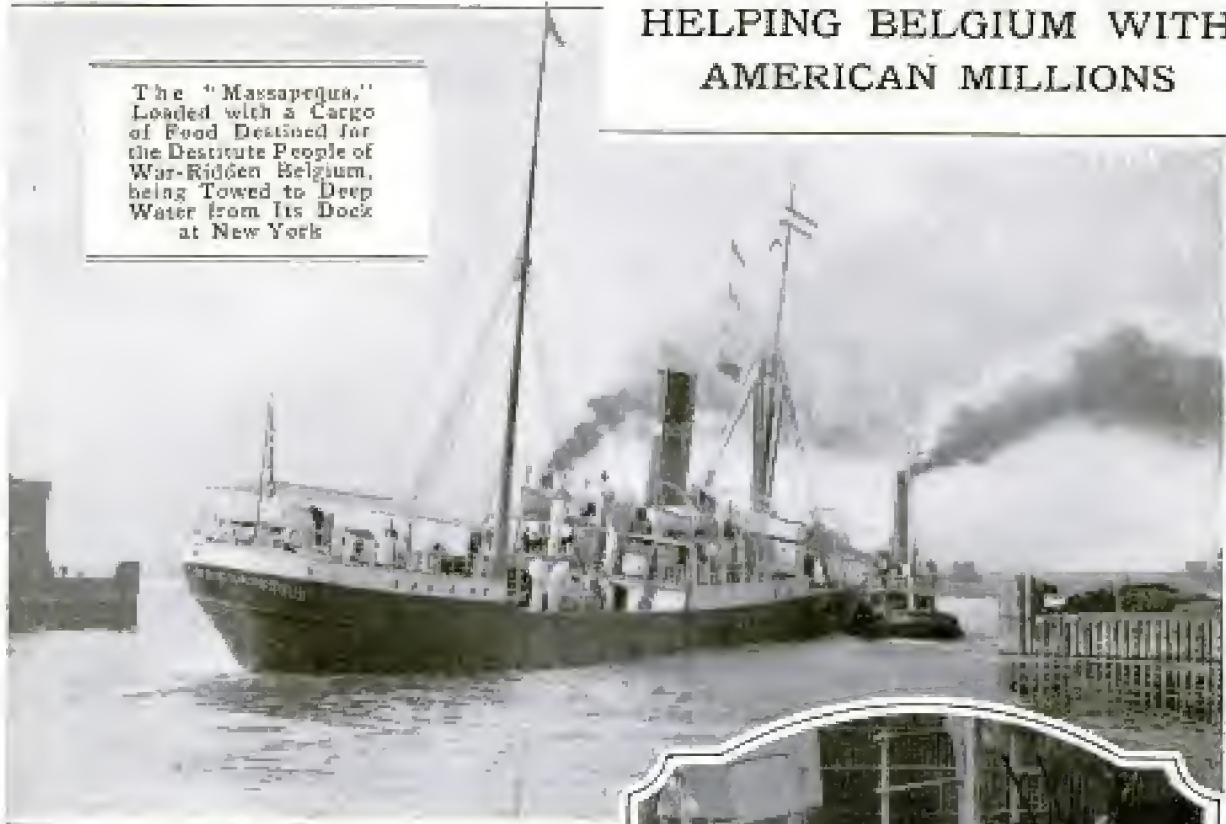
7944 — SIX HUNDRED WELLS SUNK TO SUPPLY CITY WATER

One of the largest underground waterworks systems in the world has lately been completed at Prague, Bohemia. The water is supplied by nearly 600 artesian wells 15 miles from the city and is carried in pipes by gravity to a large reservoir, from which it is pumped to a supply basin near the municipality. A strip of land, 50 ft. in width and a little more than 18 miles long, was acquired for the wells and pipe line. The former were sunk in five sections, those of each unit furnishing water for one pipe extending to the major reservoir, so that in case of any accident to one of the lines the others would be unaffected by it. Repair materials are distributed along the entire length of the main right of way, making it only a matter of a few hours to remedy any break which might occur. A certain amount of water is furnished each property owner in Prague and its suburbs, free. The quantity is in proportion to the yearly income of the building supplied. If the rental ranges between \$200 and \$1,200 a year, 5,300 cu. ft. of water are given for each \$200 of the amount, and for each additional \$400 over \$1,200, 5,300 cu. ft. more are furnished free.

*Metal Worker Plumber
+ Steam Fitter
July 31-14*

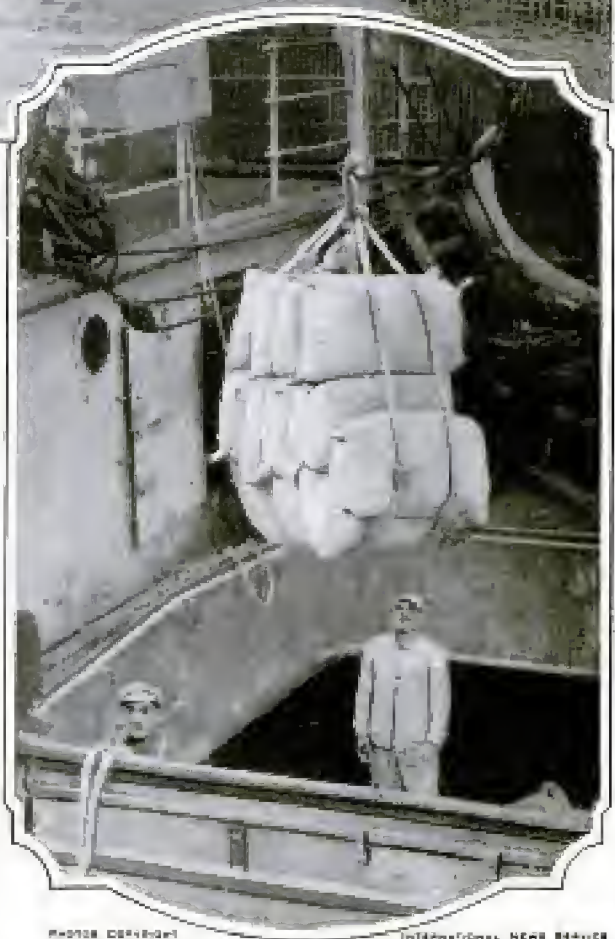
HELPING BELGIUM WITH
AMERICAN MILLIONS

The "Massapequa,"
Loaded with a Cargo
of Food Destined for
the Destitute People of
War-Ridden Belgium,
being Towed to Deep
Water from Its Dock
at New York



America's first real step toward relieving the suffering of the thousands of destitute persons in Belgium was taken early in November when the steamship "Massapequa" sailed from New York with a cargo of 4,000 tons of foodstuffs. This move was made by the Rockefeller Foundation in response to cable advices from Ambassador Page at London stating that the country was in dire need of help and that hundreds would die from starvation before food could reach them. It was possible for the foundation commission to act with promptness because it had large sums of money on hand for philanthropic purposes, although this is the first time that the funds have been used for general charity.

The "Massapequa" was the largest boat available at New York, and this was loaded immediately with flour, rice, and beans, and billed for Rotterdam, where the cargo was discharged into barges and distributed to different points. Following this the Rockefeller war-relief commission departed for Belgium to make a personal survey of the situation and direct the relief work. Arrangements also were made to sup-

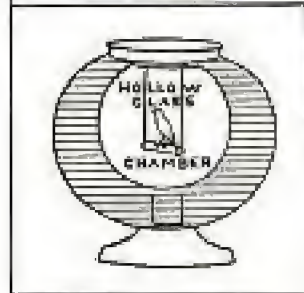


Lowering Flour, Rice, and Beans into the Hold of
the "Massapequa" Before It Set
Sail for Rotterdam

ply vessels in which general contributions of food, clothing, and other necessities, from the American people, could be shipped abroad without charge.

CANARY BIRD AND GOLDFISH 8714 IN THE SAME BOWL

An ingenious novelty is a goldfish bowl made with double walls, so that in the center there is a dry space large



This is Not an Amphibious Canary but a Double-Walled Fish Globe with a Bird Cage in the Middle

enough to form a bird cage. The fish swim about in the water between the two glass walls, while the bird, viewed from a point level with or below the top of the globe, seems also to be submerged. The first sight of what is apparently an amphibious canary, caroling away seemingly under water, is both startling and puzzling.

REMOVING ENGINE BOILERS 8574 FROM WARSHIP

When the United States revenue cutter "Seminole" was being overhauled at Arundel Cove, Md., recently, it was found that the ship's old boilers would have to be removed and new ones substituted in their place. These had originally been set while the vessel was in the course of construction, and to lift them out bodily it would have been necessary to tear out a large section of the upper deck. As it was, the

work was accomplished quickly by cutting the boilers, with oxyacetylene torches, into lengthwise strips sufficiently narrow to allow them to be hoisted through the hatches. Two men, each with a torch, cut through approximately 1,000 ft. of steel plate, averaging 1 in. in thickness, in 30 working hours. The new boilers were lowered in sections and riveted together.

JOBLESS IN CANADIAN CITY 8509 TURN TO GOLD MINING

How to provide for the army of the unemployed, thrown out of work because of the business depression resulting from the European war, is naturally a much more serious problem in the British colonies than anywhere else outside of the continent of Europe. The city of Edmonton, Canada, has found at least a partial solution, and one that puts no added burden either on the taxpayer or the charitable.

The bars of the Saskatchewan River, which runs through the city, contain much gold dust of the very fine flour variety. In the earlier days add up as late as 1900, these bars were worked by miners who then made from \$5 to \$10 a day; but of recent years operations have been abandoned. With the outbreak of the European war and the necessity of providing some profitable work for men whom war conditions might throw out of employment, the city council turned to the gold-mining industry which offered returns right within a hundred yards of the city's main streets. A number of experienced mining men who had settled in the city after the Klondike rush of '98 offered to act for a while as instructors to the uninitiated. Sample "grizzlies," a sort of combined sluice box and riffle affair, used in placer-mining territories where the gold is too fine or in too small quantity to allow the use of "rockers," "long toms," or regular sluice boxes, were built by the veterans. As a result of this action on the part of the council some two hundred men soon went to work. The average clean-up per man for the months of August

Alvin W. King,
1 Payson Ave.
Catonville, Md.

Francis J. Dickie
18 Hanover Bldg., Bellamy St., Edmonton, Alta.



Women Operating the "Grizzly," Which Separates the Gold-Bearing Sand from the Gravel. A Piece of Blanket Catches the Sand, While the Gravel is Washed Out



The Sand is Rotated in a Pan with Quicksilver and Water. The Mercury Absorbs the Gold, Which is Recovered by Squeezing the Quicksilver through Chamois Skin



Shoveling Dirt into the Sluice Box of a Grizzly is the First Step in Placer Mining. This Photograph was Taken near the Main Street of Edmonton



Side View of a Grizzly: A Wire Mesh Keeps the Larger Gravel from Falling Through to the Blanket

Scenes along the River Front at Edmonton, Canada. Where the Unemployed were Set to Digging Gold from the Beach Sands

*Jno. & Everson
200 Homewood Av.
Pittsburgh, Pa.*

8618

and September was about one dollar and a half to two dollars a day. This sum, while nowhere approaching the average man's imagination of what the placer-mining industry should yield, is, however, furnishing fair living wages for men who otherwise might be out of work.

ORGAN AND VACUUM CLEANER RING CHURCH BELLS

An ingenious musician of a Pittsburgh, Pa., church who performs the dual function of playing the organ and ringing the chimes, has devised a method of tapping the bells by striking certain of the organ keys. The operation is made possible by a stationary vacuum-cleaning apparatus. Separate chains attached to the clapper handles of the different bells are connected with pistons which move in brass cylinders. Each chamber is attached to the vacuum cleaner by a connecting pipe and is fitted with a set of electrically operated valves. The organ keys are wired so that when one of them is pressed down an electric contact is made, the valve in the cylinder is opened, and the piston drawn down by the suction of the vacuum created. This movement pulls the chain and causes the bell to which it is connected to ring. When pressure is released on the key, the valve connecting with the vacuum machine closes, air is admitted to the piston chamber and the piston raised.

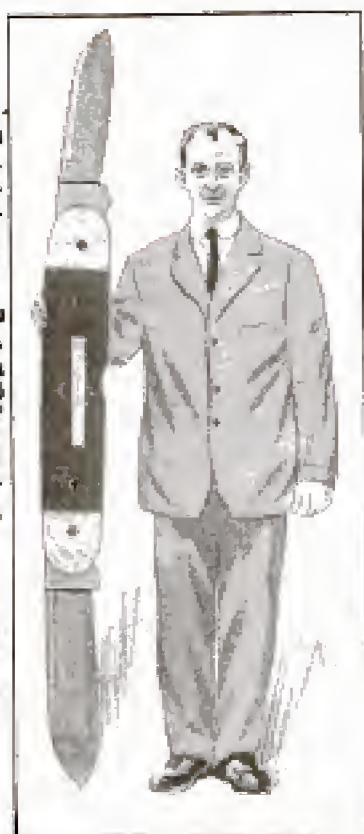
8474— SINKING SHIP RUN ASHORE AFTER BEING RAMMED

How much damage a steel ship can sustain and still keep afloat for a time was illustrated when the passenger steamer "Metapan," from Colon bound for New York, was rammed in a dense fog off the entrance to New York Harbor by the freighter "Iowan." The stem of the freighter struck the passenger vessel about 30 ft. aft of the bow on the port quarter, plowing a deep hole through the steel plates and frames. As soon as it was seen that the "Metapan" was filling, its captain headed for shoal water and was able to reach a spot where the depth was less than 40 ft. before the ship sank. All of the 77 passengers and the crew were taken off safely as the vessel rested on the bottom, the water rising only to the main deck forward, while the stern was out of water.

"POCKET" KNIFE MEASURES 8623— SIX FEET LONG

A knife large enough to serve as a pencil sharpener for the biggest giant of the fairy tales was recently finished,

after four years of labor, by a New England mechanic. When open the knife is 6 ft. 7 in. long from tip to tip of the opposite blades. Closed it measures 3 ft. 2½ in. It is 6¾ in. wide and weighs 49 lb. 2 oz. The blades are of tool steel, the springs of steel, and the tips and inlaid



name plate German silver. The handle is rosewood. It is so constructed that it can all be taken apart and put together again in a few minutes. The maker of this huge tool is a knife maker by trade, employed in a Connecticut factory. He made this knife entirely by hand, at home in his spare time, in addition to doing other regular evening work. Before beginning this knife he had made many very small ones, one measuring ⅞ in. closed and ¾ in. open, having two blades and a pearl handle.

*Made by Harry Mount
63 West St.
New Britain Conn.*

8474



The Steamship
"Metapan," Sunk
in Shoal Water at
the Entrance to
New York Harbor,
by a Collision with
the "Lowan"

Lightering
the Cargo of
the "Metapan"
as the Ship's
Forefoot
Rested on the
Bottom. All of
the Passengers
and Crew were
Saved



The Hole in the Port
Bow of the "Metapan,"
Where the "Lowan's"
Steel Prow Cut into It
as It was Entering
New York Harbor



PAUL GARDNER, NEW YORK

8582

8386

SNOW MAN TEN FEET TALL MADE IN WASHINGTON

Once in a while there is enough of a snowfall in Washington, D. C., to bring out the sleighs and give the city a truly northern appearance. It is not often, however, that the snow is deep enough or lasts long enough to encourage snow sculpture. The accompanying photograph shows how a Washington amateur artist improved the opportunity on one of these rare occasions. The snow man was 10 ft. 2 in. tall to the top of his sombrero, and was built entirely of packed snow without reinforcements of any kind.



Motor-car tires with the initials, or monogram, of the owner molded in the casings, are being introduced.

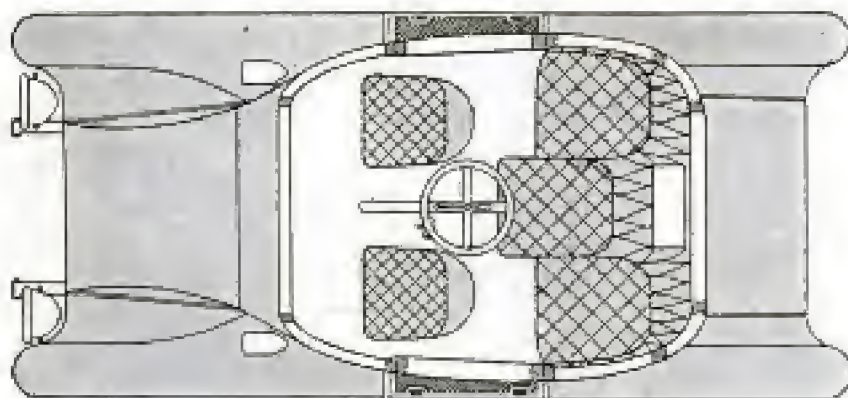
HOW COAL MINES SHOULD BE VENTILATED

Bureau of Mines

The supreme importance of good ventilation in coal mines is now generally recognized, and what constitutes good ventilation is the subject of a bulletin recently issued by the U. S. Bureau of Mines. An efficient ventilating system must supply fresh air in sufficient quantities for all the men and must dilute and render harmless, and quickly remove, all dangerous gases in the workings. Large airways and slow-moving but ample currents are better than narrow airways and air currents moving so fast that they stir up and carry the coal dust, and the ventilating fan should be kept running 24 hours a day whether there are men in the mine or not. The fan should not be placed over the shaft or in front of a drift or slope opening into the mine, but at one side, so that it will not be disabled in case of an explosion. Generally it is a serious mistake to reverse the fan. If there is a fire in the mine this is likely to drive inflammable gases over the fire and cause an explosion, and at any time there is danger that reversing the fan will push the inflammable gases out on naked lights.

CENTRAL STEERING WHEEL IN ELECTRIC MOTOR CAR

A new idea in the design of electric pleasure cars is that of placing the steering wheel in the center. The driver's seat is placed a little forward of two passenger seats, one on each side. The brake levers are placed one on each side of the steering pillar. For city service, for which electrics are almost exclusively used, the center drive is claimed to have advantages over either right-hand or left-hand drives, and provides a more symmetrical seating arrangement.



New Electric Car Designed with Center Steering Wheel,
and Having Universal Seat Arrangement

Buffalo Electrical Vehicle Co.,
Buffalo, N. Y.

CHICAGO READS WAR NEWS IN MANY TONGUES



Monroe Woolley
Ft. Casey, Island Co.
28 POPULAR MECHANICS
Wash.

8616 CONCRETE LOOKOUT TOWERS FOR COAST FORTS

The seacoast fortifications of the United States have just been equipped with new observation towers that re-



One of the New Concrete Lookout Towers for Coast Fortifications

semble small lighthouses, except there are no beacons in them. These towers are designed as places of observation for battery commanders. They overlook the guns and emplacements, and

are within calling distance of the crews who man the pieces. Cement and steel are the materials used in their construction. The observing stations of solid cement reinforced with concrete rods and having steel doors and windows, are not much bigger than ordinary dry-goods boxes. They are mounted on high pedestals of a pleasing design made of cement. Stairs, also of concrete, lead from the battery floors, to the station house. All the coast forts are being equipped with these observation stations.

TRUCKLESS TROLLEY CAR HAS 8522 BUT FOUR WHEELS

A truckless trolley car, having its steel body balanced on four wheels, placed in pairs 4 ft. each side of the center, has been built by a Boston company. The car is 33 ft. long over all, and is so designed as to seat 44 passengers, or 10 more than the standard double-end cars of the same length. This is accomplished by means of side entrances between the wheels. The height from the rails to the top of the arched roof is but 10 ft. Completely equipped the car weighs but 500 lb. per seated passenger.



This New Truckless Trolley Car Seats 44 Passengers

Lacovia Car Co.,
60 Congress St.,
Boston,
Mass.

COMMENT AND REVIEW

FOR several years past the expenditure by Americans traveling in Europe has been nearly \$300,000,000 annually. This is not saying we did not get our money's worth at that, for quite the contrary is true. Not one per cent of returning travelers regret what it cost them to see the works of art, historical monuments, beautiful cities, and how the other nations live. Even if war should end within a month or two, not many would care to cross this year. The facilities of ocean travel to other than European ports are either so limited or inadequate that our chronic travelers find themselves in a condition of "all dressed up and no place to go"—that is abroad.

*Know Our
Own Country
Better*

Europeans who have visited us are constantly amazed at the utter indifference with which Americans confess to a lack of acquaintance with the natural wonders of our own country, which they had seen when on our side. It is high time we did know our own country, and while our town halls and churches are not a thousand years old, our Niagara Falls and Rocky Mountains and Glacier Park are older than either Rome or the ruins of Herculaneum. And where on earth can one go in a palace car and find a Yellowstone Park, or a Grand Canyon of the Colorado, or a Yosemite or a Mammoth Cave, or a Great Salt Lake? Ours is a land of wonders, and though new in a constructive sense, is not lacking in interest. The South is full of surprises, the vast prairies of the Central West have no counterpart in Europe; our Great Lakes float steamers with all the luxuries of an ocean liner. The magnificent Pacific coast this year has the added attraction of a great world's fair.

Even the adventurer need not miss the excitement of mountain climbing; both Washington and Alaska furnish all the danger the most reckless might desire; and the explorer may spend years among the ancient cliff dwellers' towns in New Mexico and the petrified forests of the Bad Lands. He may search for gold and precious stones in the Death Valley; or for diamonds in the Ozarks; and hidden treasures which the pirates who sailed the Spanish Main buried along the Florida coast.

Already California and Florida are filled with winter guests as never before, and it will be a real asset if our people take advantage of this year to travel and learn their own grand country which has made them what they are.



AN animal may be too high-spirited or even a bit vicious; like to run away, or throw his rider and then, maybe, step on him, but all that is no excuse for cruelty to animals. What is needed is right management to correct his faults, and the result is something very satisfactory.

*Give the
Railroads
a Chance*

It was not the early settlers in New England, nor the pioneers who later settled Ohio and Kentucky, nor those later adventurers who crossed the plains in '49; it was not our universities, nor legislators, nor churches, which most developed our country: All these con-

tributed largely, but the one great, aggressive force which invaded the waste places and brought paved streets to the spot where smoke rose from the tents of the Indian, was the Railroad.

It is true railroads were planned and built to make money: so is every other business. It is a fact that for many years the tremendous power invested in a railroad—which was able to decree that a vast city should be here while another spot was left unknown—naturally imparted its spirit of power and aggression to the men who conducted it. And like any other kind of unrestrained power it grew and grew and gradually became overbearing. This attitude, which the elder Vanderbilt so forcibly expressed, was a long time in the making, and the public came to feel that any hardship which could be wished on a railroad was fully deserved. State legislators found in severe laws a sure and easy avenue to popular favor; hence in a few years the pendulum swung to the other extreme.



DURING this period of the growing apart of railroad management and its patrons, there was also an epidemic of high finance, in which railroad securities were juggled and watered in a scandalous manner. The offense resulted in a severe attack of financial indigestion for the chief offenders, a condition which spread until every railroad, even the best managed, became more or less infected. Like any other sick thing, they were no longer able to do the good work of which they are capable.

*High Finance
and High
Legislation*

Conditions have changed to a marked degree, and today a man with business in the general office of a railroad seldom fails to receive a prompt and courteous audience. High finance has become a dangerous and unsavory undertaking, and it may truthfully be said a genuine reformation is in progress all along the line. The entire business of the country is so absolutely dependent upon an efficient operation of its railroads that what is bad for the roads is bad for all of us. Admitting the roads have erred in the past, there is no reason why they should be relentlessly punished for all time. With abundant evidence of reform, the logical course is to use what influence each one has to help them. It's manifestly unfair to hit a man because he is down. In this light the action of the Interstate Commerce Commission would seem unfair and unjust. With traffic at a low ebb, and expenses abnormally high, owing to increased cost of everything it uses, their only relief is in advanced rates. Business organizations the country over, business men, manufacturers, and freight payers generally, are either urging the granting of an increase, or at least not opposing it. The commission, with almost czarlike attitude, refrains from granting the much-needed relief. After a year of weary waiting, a modicum of relief was granted, but not enough to improve the situation. Employes in plants which turn out railroad supplies are idle by thousands; repairs of all kinds are neglected; meanwhile the commission, which is a law unto itself and responsible neither to Congress nor the administration, is asleep at the switch. In its effects upon the

country at large, this inaction is producing results quite as disastrous as anything of which high finance was guilty.

With all their shortcomings, our railroads are the great arteries of transportation; what impedes them blocks the wheels of industry.



"MADE in Germany" is a trade-mark known and translated into the language of every country of importance, and many others of which one seldom hears. The phrase has reached into every portion of the globe, and must be credited as a stamp of good quality at a surprisingly low price. Apparently our own exporting manufacturers have been quite indifferent to the cumulative value of emphasizing the fact that their goods were made in the United States. Now that Great Britain, which prior to the war was an enormous consumer, has put the ban on everything

*Made in
the U. S.*

"Made in Germany," and is so strongly encouraging the use of "Made in England," it has occurred to our manufacturers it was time we did something of the sort. Some are using "Made in America," but to be of largest value we should state "Made in United States."

No other country has ever been the worshiper of anything and everything foreign, from clocks to counts, as the United States. We have believed, and to this our retail merchants have largely contributed, that because an article was imported it was therefore greatly superior to our own make. Of many articles it was and still is true that the imported is actually better than the homemade. On the other hand, millions of dollars' worth of goods made right here in the United States have been fraudulently sold as imported. That customers have gone on buying and using these homemade goods for several years proves their excellence. The manufacturers guilty of this deception are now paying the penalty, and must commence anew to educate the public up to an appreciation of what they have liked under another name. It is quite time we learn the excellence of our own products, and begin to rate ourselves at our real worth.



A SORT of paradox is the fact that thousands of people who make no effort to save a dollar when times are highly prosperous will develop and practice economy when work and opportunity are less plentiful. The best way, of course, is to try and save at least a little all the time, putting by a larger amount when earnings are at their height. As a nation we are not taught that economy which makes France the banker of the world, and whose accumulations come not from vast exports of natural resources, but from the combined small savings, consistently continued year after year, by the French people as a whole.

*What \$10
will Do*

If the people of this country would save during the year 1915 an average of \$10 per capita, the grand total at the end of the first twelve months would be the magnificent sum of One Billion Dollars.

The French save, partly because it has become hereditary, and chiefly because the children are brought up that way and are taught

the dignity of accumulation. We, on the contrary, in a spirit of false pride, are inclined to scorn the necessity of saving, as though it were something of which to be ashamed. If our present experiences shall teach us thrift, it will be a strengthening of a great national weakness.



A MOST remarkable change has come about during the past thirty days, regarding the requirements of our navy and army. Those who have consistently stood for an increase in one or both have been confirmed in their belief; those who were indifferent have awakened, while those others who believed the time was at hand when the lamb could enter in safety the lion's den have realized their mistake. Reluctantly and sadly some of the most pronounced advocates of universal peace have seen their dreams disillusioned. Nor is there anything inconsistent in still advocating and working for that world-wide peace agreement while facing conditions as they are.

*Strengthen
the Navy*

Our United States, the richest country in the world, offers a prize of stupendous value. We have treaties, it is true, but, as one of our great railroad presidents once remarked of a contract, they are really binding only so long as both parties are willing to keep them. Our wealth at home and our territory far distant have both been largely increased while the night watch remains the same. The well-guarded treasure vaults are seldom raided, the chance of success is entirely too remote. That a hostile fleet could come within firing range of New York City and demand and collect an indemnity of one billion dollars seemed to most people an absolute absurdity only a few weeks ago.

The size of our military clothes is no bigger than years ago when we were scarcely half as large as now. We actually lack sufficient men to man the ships we already have, and need still more ships and additional men for them. Our coast defenses, which were never very formidable, are in these days of long-range heavy guns almost a joke. We have deluded ourselves with the comfortable feeling that although our ammunition was a mere handful, forsooth, we with our boasted ingenuity and energy could take a few days off our other businesses and make up a supply when needed, forgetting the guns we already have can use up in an hour all we can make in a week. Guns and gunners are dry wells in a desert without their powder. Both our army and navy are highly efficient to the extent of their numbers, but each is far too small.

The thunders of war rolling across unhappy Europe echo through the empty halls of that grand Palace of Peace in the city of The Hague. For the present, the spirit of its inception and its benevolent purpose seem to be forgotten as the horrors of the dark ages seethe and surge. That some day its now vacant chambers will contain the councils of nations gathered in a spirit of true amity, we all hope and many believe. God speed that day. But, while the peace doctor is coming, it is well for us to have some first aid to the injured handy.

Write your congressman.

November 25, 1914.

H. H. WINDSOR

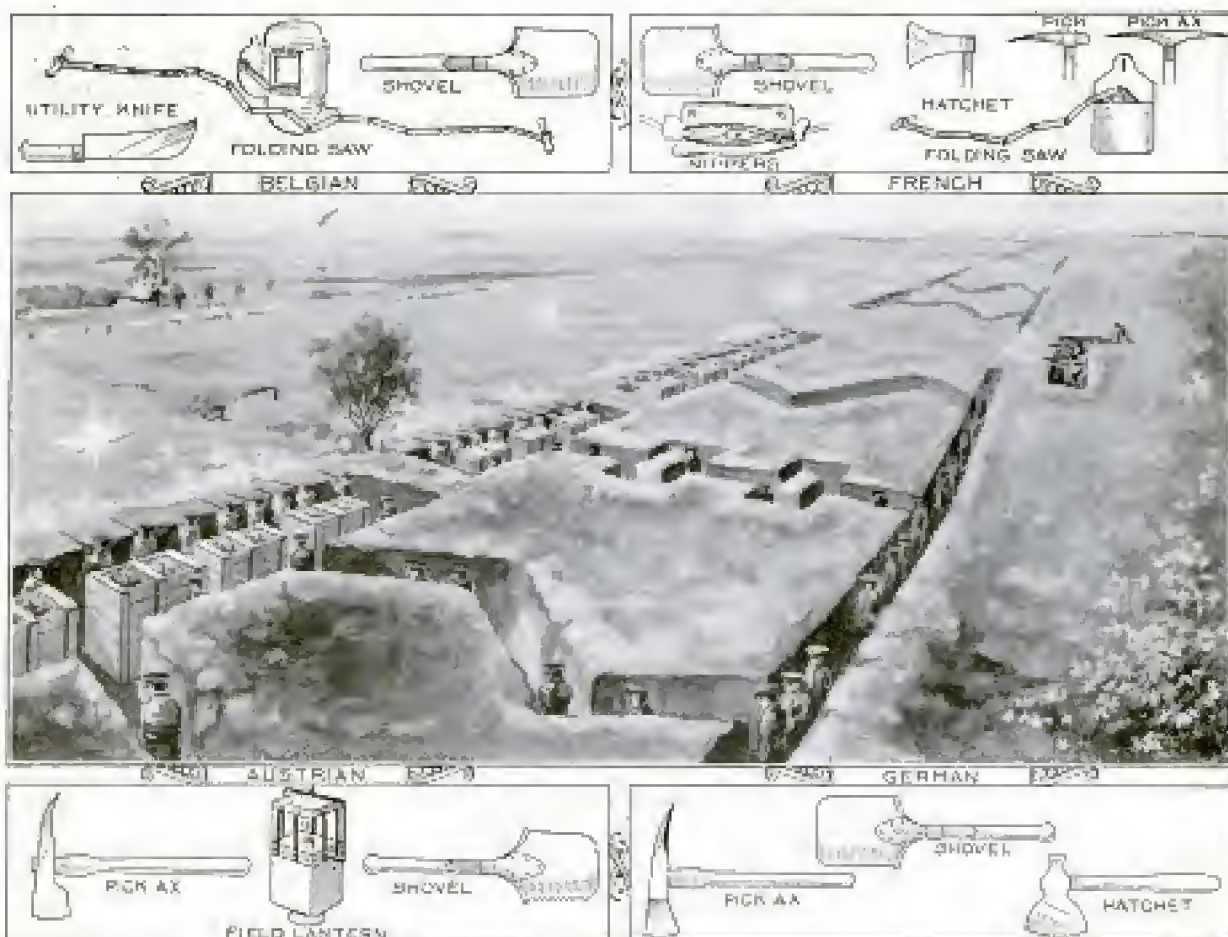
"DIGGING IN" ON THE FIRING LINE

How the Soldiers of the Armies at War Fight and Live—
and Die—Underground in the Trenches

LYING flat on the ground, alternately digging with his bayonet blade and scooping out the loosened earth with the top of his meat can, a soldier hastily makes at his side a shallow trench that extends from the head to the knees, placing each little scoopful, as he digs it, in a pile at his head. Every movement is made with the utmost caution, for bullets are whistling past only a few inches above his head and the raising of any part of his body would mean almost certain death. When this shallow trench is finished the soldier cautiously rolls into it. Under this slight cover he then begins to dig another and deeper trench at his side, but one that is long enough this time to take his entire body. If he lives to complete

the task, he has made what is known as a "lying-down" trench. He has made a cover that protects him from rifle fire but not from shrapnel or the flying fragments of bursting shells.

This is not an individual instance but a typical case. It is one phase of the "digging-in" process that comprises one of the biggest features of the biggest war the world has ever known. When a column of soldiers has advanced until it can advance no farther, and the men are ordered to hold their exposed position, they "dig themselves in" in this fashion. Perhaps they are compelled to remain where they are, for a retreat over exposed ground is often as dangerous as an advance. As soon as night comes, intrenching tools are brought forward, and the little



This Is a Typical Example of More Elaborate Systems of Intrenchments, with Trenches in the Rear for Reserve Troops and Zigzag Trenches That Provide Safe Access to the Firing Line. At the Center and Rear of the System Is an Emplacement for Machine Guns. Intrenching Tools for the Different Armies are Shown Above and Below

trenches made under fire are enlarged, connected, and deepened until they are continuous, and furnish cover in which men may stand and move about safe from rifle fire, but always in danger from shell fire and shrapnel. In this shelter that the soldier has dug for himself he may remain for weeks, or the trench may be abandoned in a few minutes or a few hours for an advance or a retreat. In the face of modern weapons, infantry troops, fighting long in the open, simply get themselves slaughtered, and the first thing an army does after its preliminary advance has been stopped is to dig itself in.

Two things that the present war has demonstrated conclusively are the supreme importance of field intrenchments and the futility of permanent fortifications, except as a means of de-

ly for concealed guns located miles away. The best concrete construction cannot stand up against modern mortars and siege guns, as was demonstrated at Liege, Namur, and Antwerp. A slender line of intrenchments is not permanent in its character and in these days of smokeless powder intrenched lines are usually hard to find, for it is a part of the soldier's business to make them as inconspicuous as possible, and if they are found and destroyed or made too dangerous for the defenders, trenches on a new location are easily and quickly made.

This war is therefore primarily one of field intrenchments. Much had been written before the war about field intrenchments and their importance in modern warfare. But a battle line 300 miles long, extending from the North Sea through northern France into Alsace, consisting of practically continuous lines of intrenchments so securely held that neither side could make any material advance in weeks, is a thing so big that it had apparently never been dreamed of.



Abandoned Trench in the Aisne Valley, with Wrecked Overhead Shrapnel Shelter

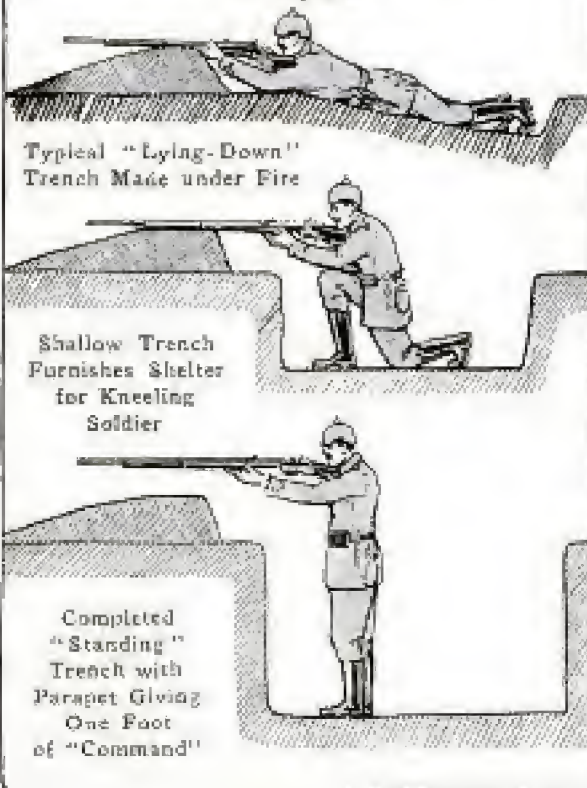
laying the enemy. The exact location of a fort is either known in advance or can be determined by observation, so that the range can be found accurate-



Lines of Intrenchments Dug in the Rear, for the Army to Fall Back On in Case of Retreat, are Carefully Constructed in Strategic Positions



French Troops Building Intrenchments outside Paris When That City Was in Danger of Capture



Along this battle field the country is cut up, not by two parallel lines of intrenchments alone, but by numerous trenches, some of which have been occupied repeatedly by first one army and then the other as the fortune of battle wavered along the battle line. There are new and half-finished trenches, trenches with shrapnel-proof shelters and with zigzag excavated approaches from the rear, abandoned trenches and trenches that have been wrecked by artillery fire. So carefully are the trenches and their occupants concealed that the bat-

tle field would have, much of the time, the appearance of a deserted country, if it were not for the bursting shells and shrapnel. Back of the firing line, on both sides of the great conflict, men have been busy for weeks constructing trenches for the army to fall back on in case of retreat. Since this work is not done under fire, these trenches are carefully made on selected ground, often motor-drawn plows being used to break ground for them.

The business of making field intrenchments has been so carefully studied that it is one of the best understood features of a military campaign, and every soldier is thoroughly trained in it. It is hard work, and the recruit seldom takes to it kindly, but with a little experience under fire he soon learns to love his intrenching tools. Trenches constructed under fire in an exposed position are always made first as "lying-down" trenches. Then if the position is to be held, the first opportunity—usually that given by darkness—is taken to enlarge these into "standing" trenches, and the dirt taken out is carefully placed in front of the trench to serve as a parapet. After this, the trench may be developed into an elaborate defensive position, with space for passing behind the men constituting the firing line, with caves or overhead covers to serve as shelter

from shrapnel, and with zigzag connecting trenches running back to natural cover in the rear. Many of the trenches have no safe connection with the rear, and with these the work of relieving the worn-out soldiers on the firing line, of forwarding ammunition and supplies, and of taking away the dead and wounded can only be done at night. In some of their trenches the British troops have solved the problem of access by building behind the trenches a line of rough wooden cribs filled with earth or stone and built high enough to furnish cover for a man in a stooping posture.

Of the different types of trenches the ordinary standing trench is the most common. This is usually $2\frac{1}{4}$ ft. wide at the top, $1\frac{3}{4}$ ft. wide at the bottom, and of such a height that a man standing erect will see easily over the parapet. A ledge 1 ft. wide furnishes an elbow rest for the soldier as he fires his rifle, and above this projects the parapet, the whole giv-

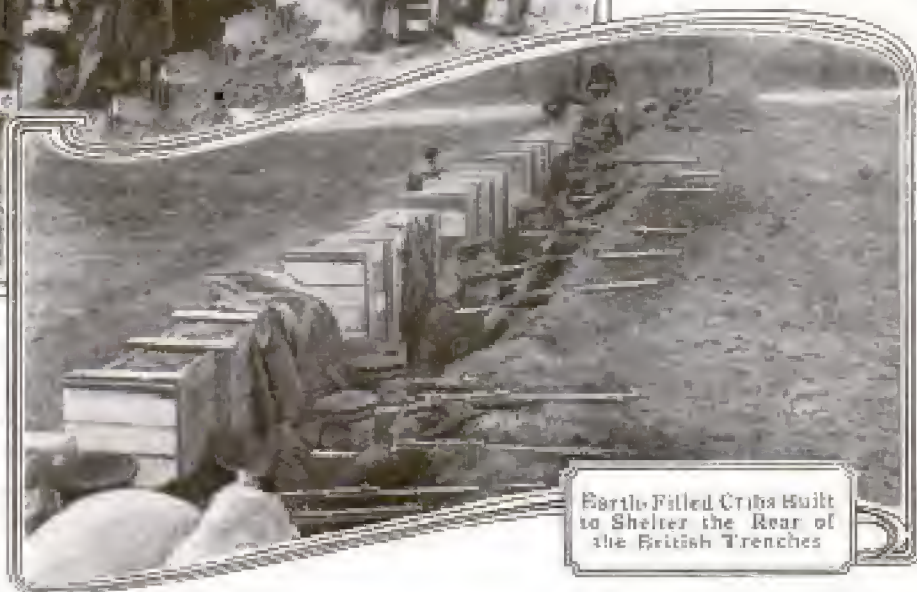
thoroughly compacted, to stop rifle bullets, and is made with flat slopes so that it will appear as a slight natural elevation in the ground. Beyond this simple construction the trench may be carried to almost any degree of elaboration. When shrapnel is being used against a line in the open it is fired on a flat trajectory, but when trenches are being "searched" high-angle fire is used, so that as the shell bursts in the air the bullets scatter downward at a sharp angle behind the earthwork. If the enemy has the correct range, it is practically impossible for men to live in open trenches under high-angle shrapnel fire. If left to his own devices any soldier will not only dig himself in in the most thorough manner, but will build protection of some kind against this danger. There are two forms of protection being used extensively in the European war. One is a shrapnel-proof roof made of rough timber, brush, and earth placed at intervals across the top of the trench,

while the other is a series of caves dug into the front of the trench and braced with timbers. When shrapnel fire becomes too hot, the only thing left for the defenders is to



British Troops Storing Ammunition in the Trenches at Antwerp

ing a "command," or view, above the surface of the ground, of from 1 ft. to $1\frac{1}{2}$ ft. The parapet is



Earth-Filled Cribs Built to Shelter the Rear of the British Trenches

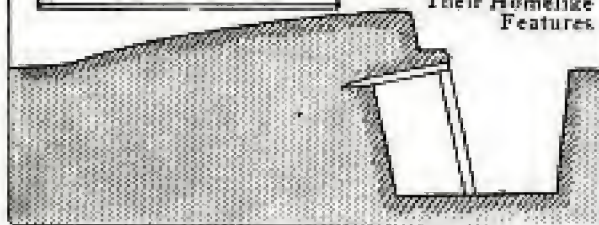


Building a Cave Shelter:
Form of Construction
Shown Below



Former German Trenches, Now Allied

The Cave Shelters,
Though Crude, Have
Their Homelike
Features



seek such shelter as they have been able to build. With the possible exception of the caves, there is no shelter that is effective against the big shells thrown by modern guns.

Since men not only fight in the trenches, but must often eat and sleep in them, the cave shelters have become one of the common features of the intrenchments on both sides of the battle field, and, crude as they are, they furnish the one homelike touch of the war. Here are found dishes, simple cooking utensils and, the ever-present coffee or teapot, the latter being indispensable for the English soldier. In spite of the discomforts and dangers of the trenches, human nature, with its philosophy and a grim sort of humor, asserts itself. Much ingenuity has been expended in naming the shelters scattered along the trenches, and it is not an uncommon thing to see a crude sign above one of the caves bearing some such name as "Hotel Cecil," "Ritz Hotel," "Billet Doux Hotel," or "Rue Dormir."

Hour after hour the men in the trenches stand patiently watching for a chance to put in a telling shot, and so closely does each side watch the trenches of the other that a helmet or kepi showing above the earthworks is sure to bring a volley that may be fatal. With both sides so thoroughly intrenched, the result for weeks may be simply a deadlock, but in spite of this some advances are made. Night attacks are common and the shelling of the enemy's trenches goes on constantly. If trenches are strongly held they may be shelled and "sprinkled" with shrapnel for days, before the attacking party thinks it worth while to attempt to rush them. Even then the defense may only be "subdued," this being a military term meaning that so many of the defenders have been killed that the survivors are no longer able to put up an effective defense.

While the trenches themselves furnish a certain degree of safety, the area between them is a veritable zone of death. Men killed in a sortie lie unburied until one side or the other has made an advance, as such a thing as a truce for burying the dead appears to be unknown in this war, while men who fall wounded in this zone are doomed unless they are fortunate enough to live through the rain of deadly missiles until night and are then able to drag themselves out of danger.

Alfred Waldeck,
211 W. Saratoga St.,
Baltimore Md.

John Hays Hammond, Jr.,
Gloucester Mass.

POPULAR MECHANICS.

BUOY COMMEMORATES "STAR- 870 SPANGLED BANNER"

Off the entrance to Baltimore Harbor a unique buoy was erected Sept. 5, 1914, to commemorate the hundredth



This Buoy Marks the Spot in Baltimore Harbor Where "The Star-Spangled Banner" was Written

anniversary of the writing of the national anthem, "The Star-Spangled Banner." The buoy has been anchored, as nearly as possible, on the spot where Francis Scott Key wrote the song while a prisoner on the British frigate "Minden." It has red and white stripes with white stars on a blue field.

WIRELESS-CONTROLLED BOAT 8816 GOES 28 MILES

Control of vessels and self-propelled torpedoes at a distance by means of wireless impulses was successfully demonstrated recently in the presence of officers of the United States Army and Navy, by John Hays Hammond, Jr., whose earlier experiments in this line have previously been referred to in this magazine. The boat "Natalia," built by Mr. Hammond, was maneuvered around Boston Harbor and out into the open sea as far as Graves Light, a distance of 28 miles, and safely back. There was not a living person on the boat, all of its movements being directed by a single wireless operator stationed at Marblehead, more than 20 miles away.

While the details of the mechanism by which the vessel is controlled have not been made public, it is understood that it involves the use of a new type of wireless coherer.

Besides being susceptible to control by wireless waves, the electrical steering machinery may also be actuated by the beams of a searchlight acting on selenium cells. Selenium has the property of varying its electrical resistance in proportion to the amount of light falling upon it. To demonstrate the possibility of controlling propelling machinery by means of light, Mr. Hammond has built a device which he calls the "electric dog." This is a box mounted on three wheels, containing a motor operated by a storage battery, with another motor which actuates the steering wheel. At one end of the box are two bull's-eyes of glass, with a partition projecting between them so that light shining into one of the eyes does not reach the other. Behind each bull's-eye is a screen of selenium. When a light shines into the right eye, the steering wheel is turned so that the "dog" turns to the right, and vice versa. This curious contrivance will follow the light of a lantern at night, trailing along behind the person carrying the light and turning corners as though it were alive.

See pop elec mech 1/16 10.4.14

See Feb'y 11 - 241 - Wireless
 " Mar 14 - 409 - Boats

POPULAR MECHANICS

39



FARTHEST EAST IN THE WORLD-WIDE WAR



COPYRIGHT, INTERNATIONAL NEWS SERVICE
German Soldier with Range Finder
and Chinese Coolies in the
Port at Tsing-Tau



COPYRIGHT, INTERNATIONAL NEWS SERVICE
German Troops Defending Tsing-Tau
with a Machine Gun, Preparing to
Resist the Attack of the
Japanese Forces



"Comfort Bags" for Japanese
Soldiers, Distributed by the
Dai Nippon Nurses'
Society

WITH THE BRITISH FORCES IN THE FIELD



A Detachment of the British Rapid-Firing Squad Turning Their Machine Gun on the Enemy



A British Soldier with the War Poster Which is being Displayed Throughout Germany. Showing the 42-Centimeter Shell



Deutsche Kriegs-Überraschung, 1914

Unsere 42cm Bombe

Erfolge:

Lüttich 13 August



Wanzen 23. August

Longwy 27. August



Mauberge 1. September

Alit Gott

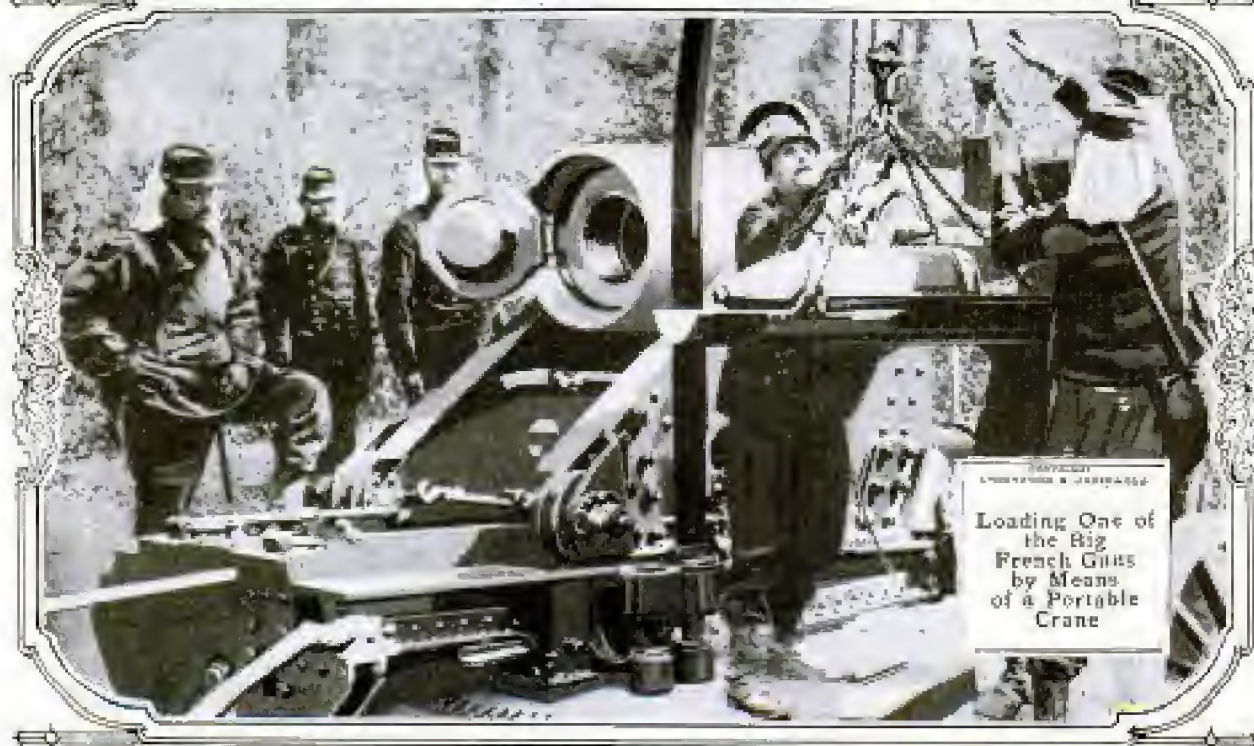
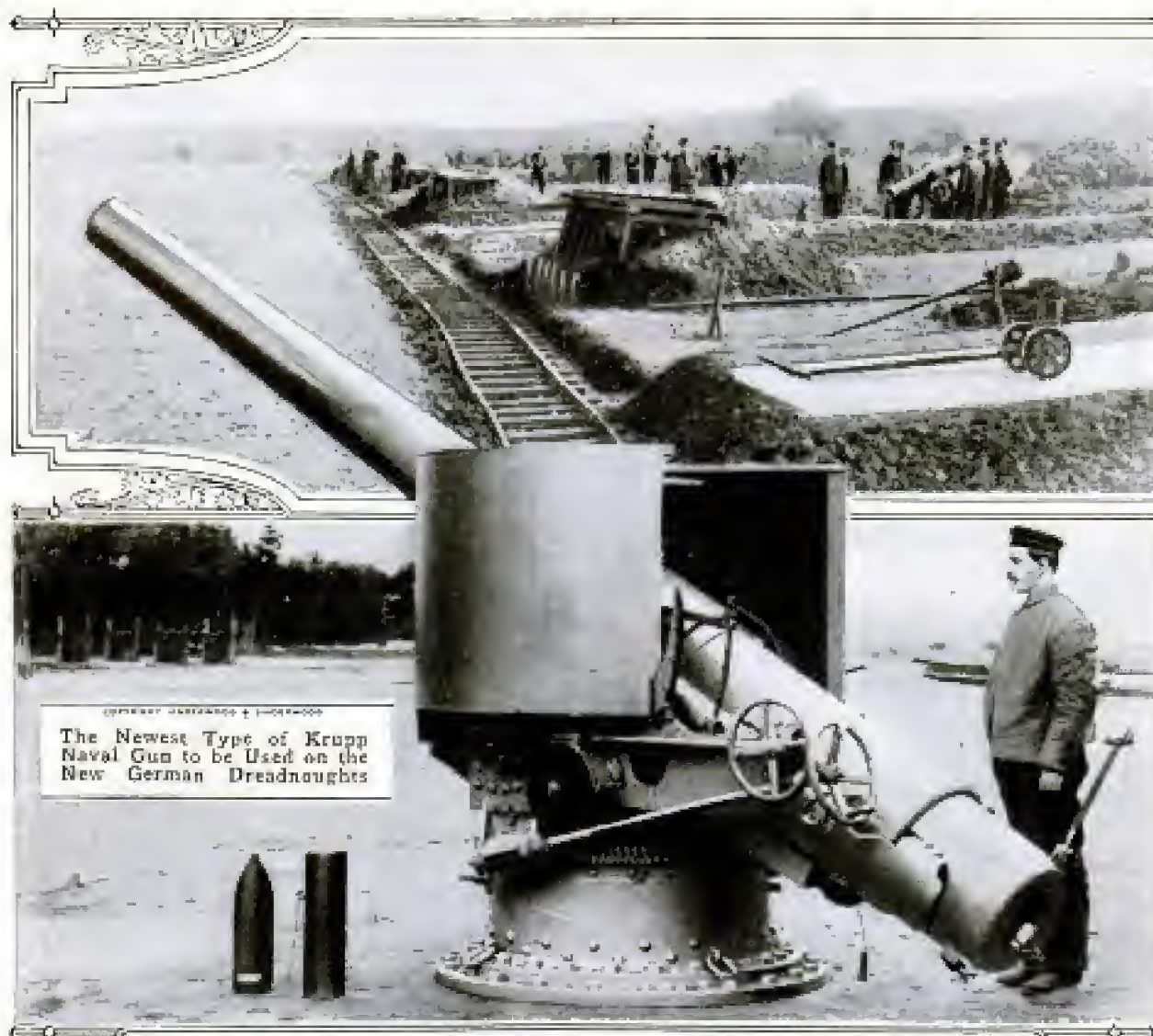
für

König und Vaterland

COURTESY L'ILLUSTRATION

His Royal Highness, the Prince of Wales, Serving as Color Bearer

VARIOUS TYPES OF GUNS, HEAVY AND LIGHT,



THAT ARE BEING USED BY EUROPE'S ARMIES



PHOTOGRAPHS THAT TELL TALES OF DISASTER,



The First Serious Disaster to the British Navy Was the Sinking of the *Invincible*. It is Believed the "*Audacious*" was Sunk by a Torpedo Fired Nearly Two Weeks, Although the Beaching of the Battleship and the "*Olympic*," from the Deck of Which



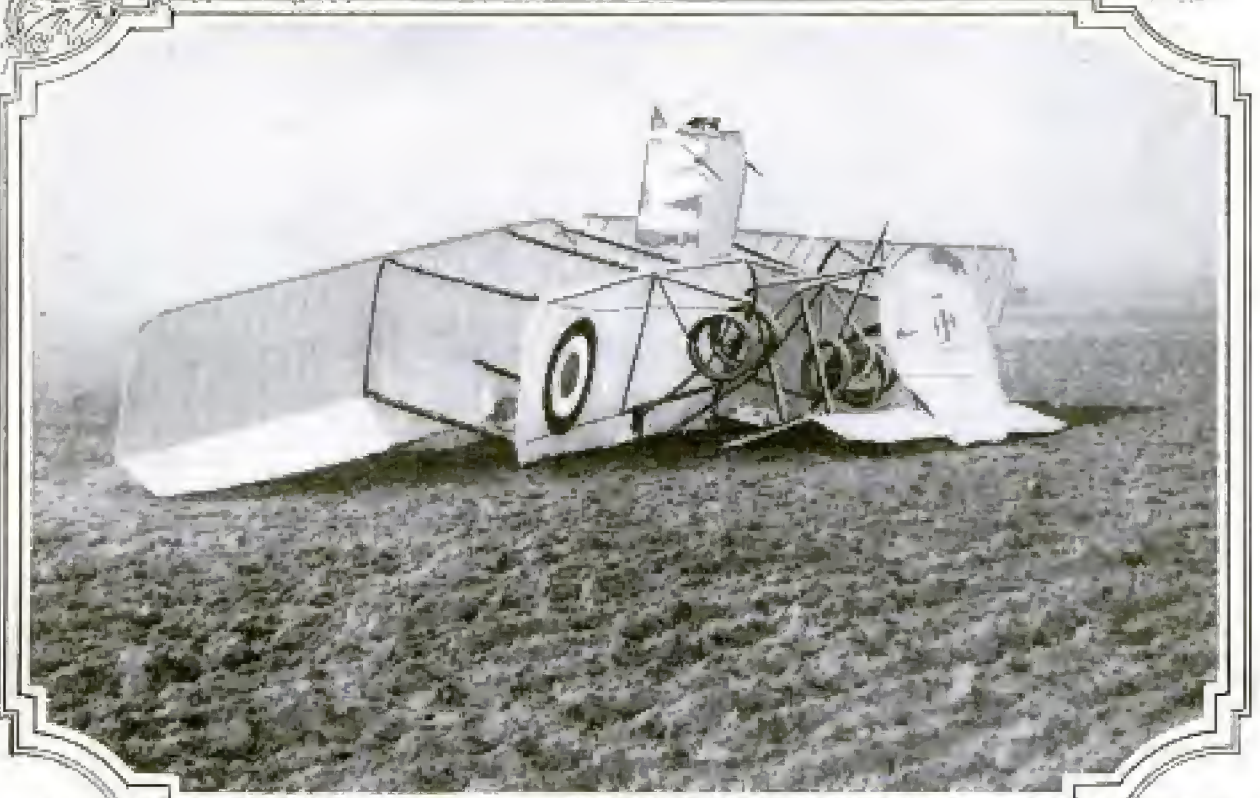
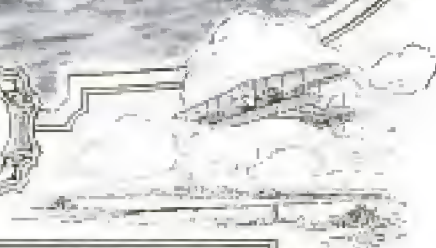
The British Hospital Ship "*Rohilla*," on Its Way from Leith to Dunkirk to Bring Wounded British and Belgian Soldiers from the Battleground of Northern France, was Wrecked at Whitby on the East Coast of England. The Photograph Shows Life Guards Trying to Get a Line to the Wreck

WRECKAGE, AND RUIN—THE PRICE OF WAR



Copyright, 1917, by the United States Navy

Great Battleship "Audacious" Off the Naval Base at Lough Swilly, from a German Submarine. News of the Event was Suppressed for Rescue of Its Crew were Witnessed by the Passengers of the Liner This Remarkable Photograph was Taken



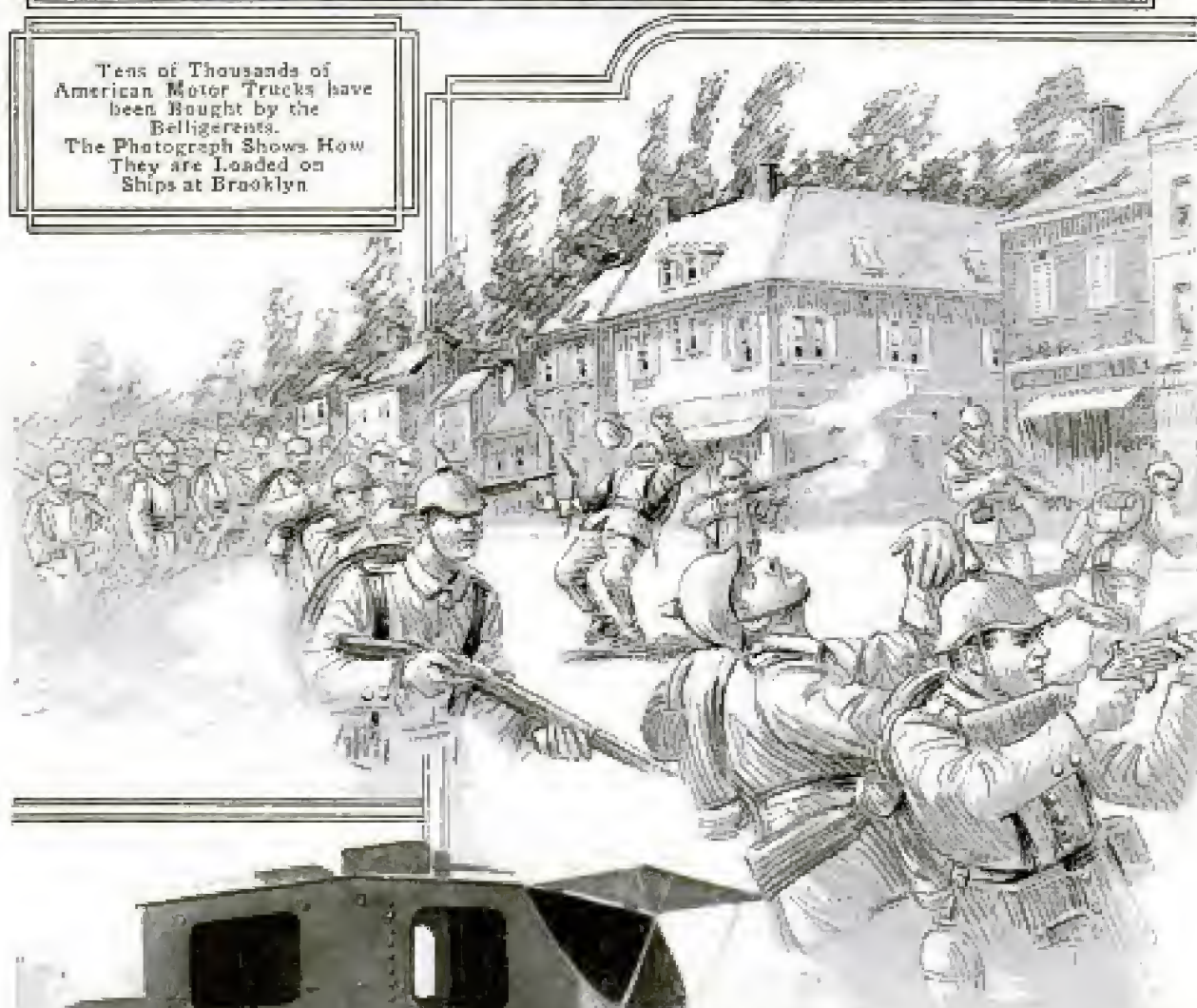
Copyright, 1917, by the United States Navy

This Photograph of a German Military Aeroplane Brought Down by the Allies Near the Yser Shows Not Only the Construction of the Taube Machines but the Distinctive Markings by Which German Fliers are Recognized—the Two Bull's-Eyes on the Lower Planes and the Maltese Cross on the Rudder

MOTORS OF ALL KINDS, INCLUDING AMERICAN,



Tens of Thousands of American Motor Trucks have been Bought by the Belligerents. The Photograph Shows How They are Loaded on Ships at Brooklyn

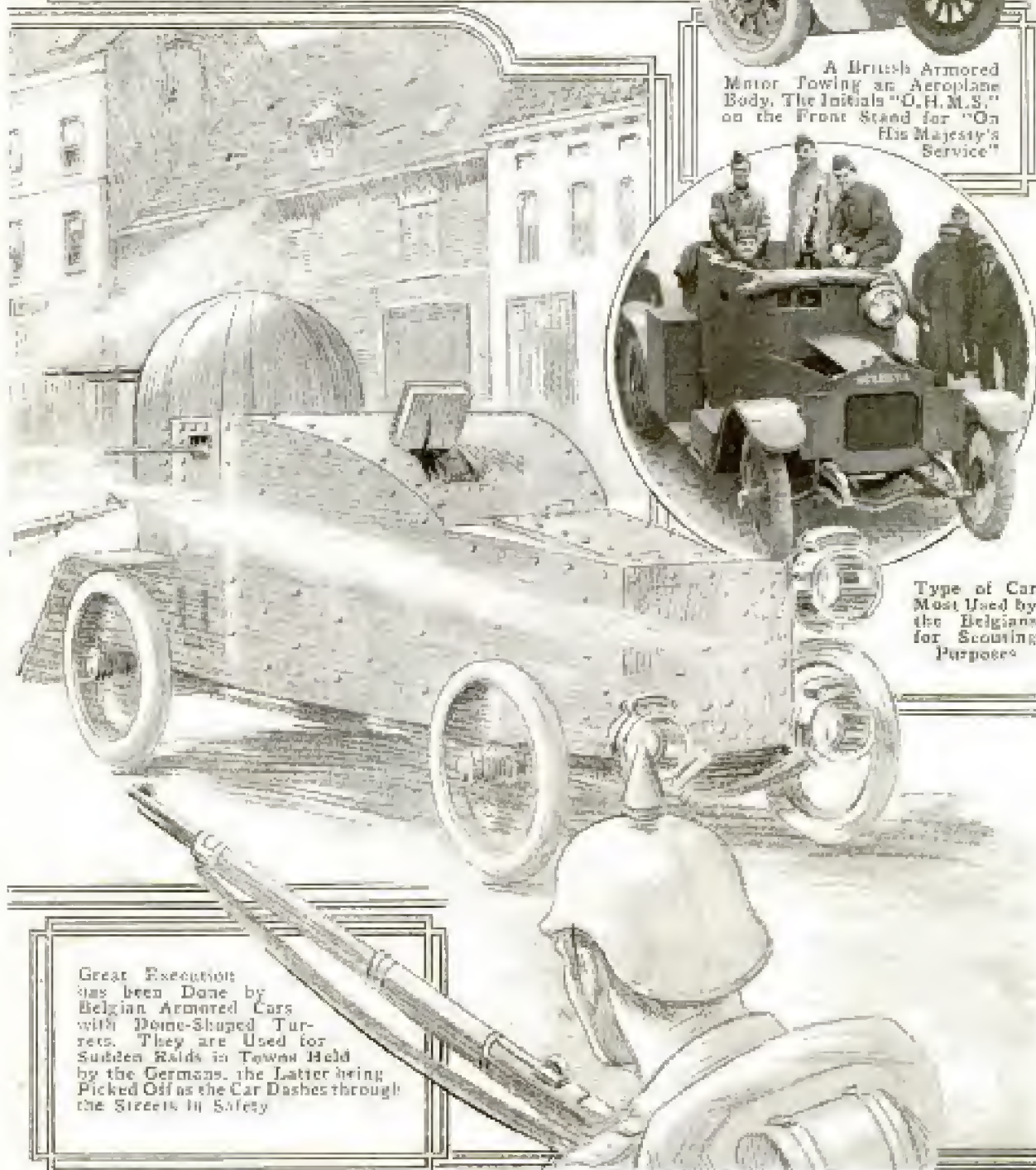


Another Type of British Armored Car of Which Many Are Now in Use on the Continent, Mainly for Scouting Purposes

IMPORTANT FACTORS IN THE "GASOLINE WAR"



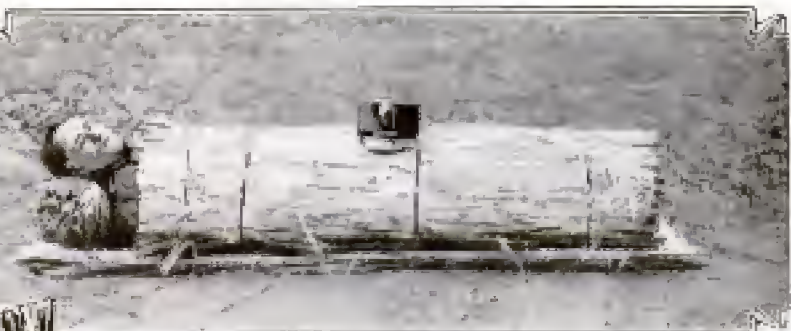
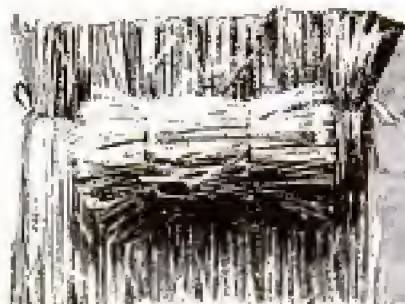
A British Armored Motor Towing an Aeroplane Body. The Initials "O.H.M.S." on the Front Stand for "On His Majesty's Service"



Type of Car Most Used by the Belgians for Scouting Purposes

Great Execution has been Done by Belgian Armored Cars with Dome-Shaped Turrets. They are Used for Sudden Raids in Towns Held by the Germans, the Latter being Picked Off as the Car Dashes through the Streets in Safety

CARING FOR THE WOUNDED AND THE DEAD



COPYRIGHT, UNDERWOOD & UNDERWOOD

This Stretcher for the Wounded is Made of Straw and Rushes. It can be Used as a Bed in Field Hospitals and is Cheap Enough to be Burned When Soiled or Infected



COPYRIGHT, UNDERWOOD & UNDERWOOD
Twelve French Soldiers were Hastily Buried in This Unmarked Grave



COPYRIGHT, UNDERWOOD & UNDERWOOD
Villagers Carrying German Dead from the Belgian Battle Fields

SOME MILITARY MEANS OF COMMUNICATION



ARMY
COMMUNICATIONS
—1918—

A French Outpost
Communicating
with His Army
Headquarters by
Means of a Field
Telephone

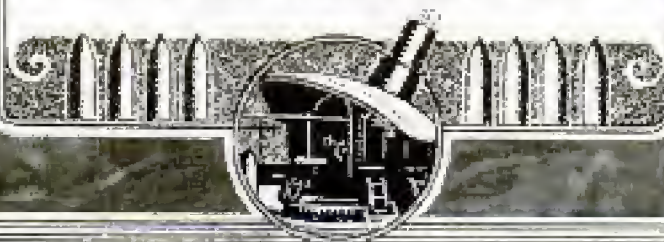
Thousands of
Crates of Carrier
Pigeons, Used by
the Belgian Army,
Captured by
the Germans in
Brussels

A Belgian Red-Cross
Motorcycle Disabled
by a German Shell,
Its Rider Evidently
Not Greatly Worried

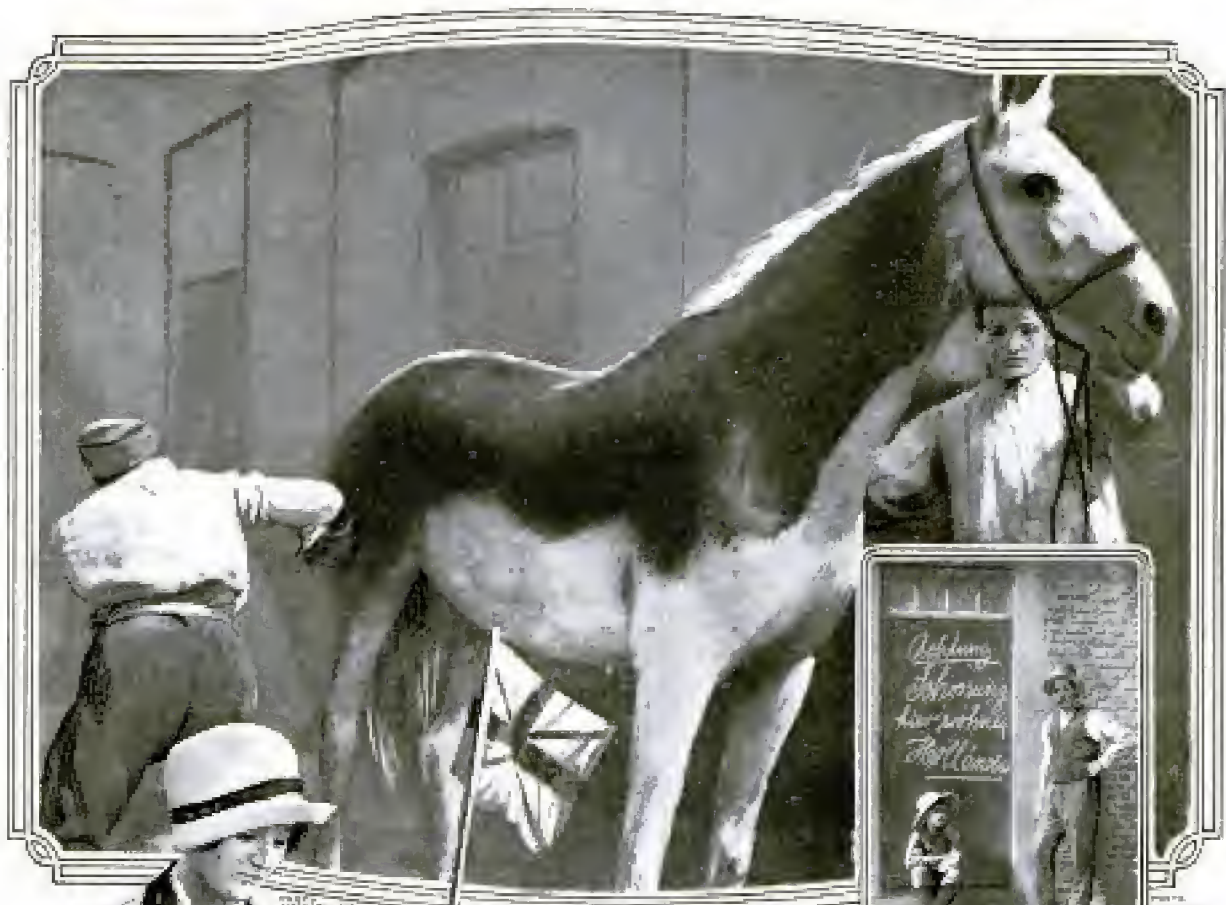
HOW A BOMBARDMENT LOOKS AT CLOSE RANGE



The Risks a War Photographer Runs are Graphically Indicated in This Remarkable Photograph, Taken during the Bombardment of Antwerp. The Camera Was Close Enough, When a German Shell Burst, to Catch the Wall as It Fell Outward



SOME CURIOUS PHASES OF THE GREAT WAR



Germans Dyeing a Gray Horse Khaki Color to Make the Animal a Less Conspicuous Target

"Warning! Hands Off! Hollanders Live Here" is a Free Translation of This Sign on a Door in Vise

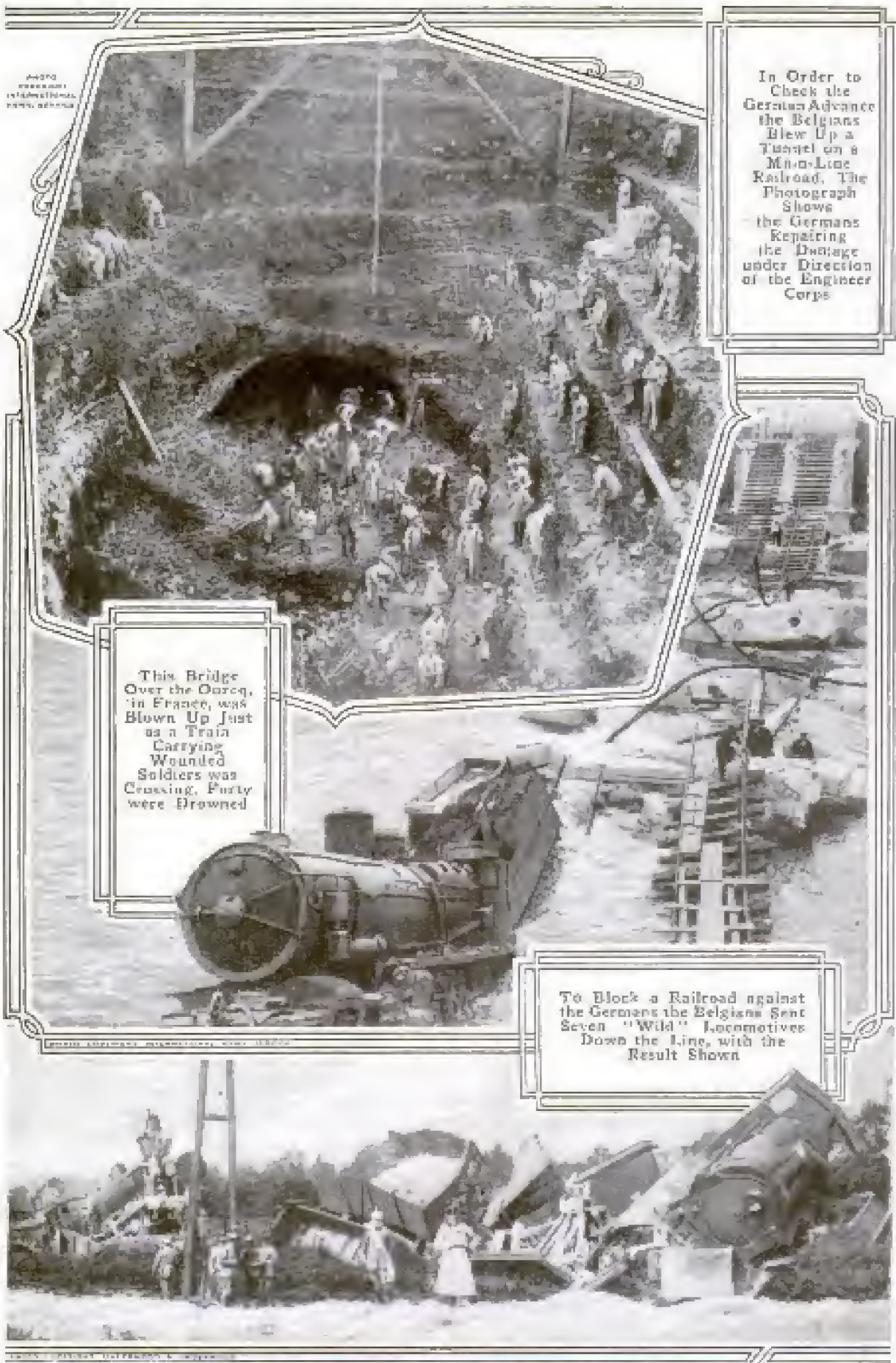


A New British War Toy That Produces a Sound Like the Kettledrums of a Cavalry Band



Belgians Trying on a Smoke Helmet Used by Germans When Seeing Houses on Fire

PARTS PLAYED BY RAILROADS IN THE WAR



In Order to Check the German Advance the Belgians Blew Up a Tunnel on a Main-Line Railroad. The Photograph Shows the Germans Repairing the Damage under Direction of the Engineer Corps

This Bridge Over the Oise, in France, was Blown Up Just as a Train Carrying Wounded Soldiers was Crossing. Forty were Drowned

To Block a Railroad against the Germans the Belgians Sent Seven "Wild" Locomotives Down the Line, with the Result Shown

ON THE FIRING LINE ALONG THE AISNE



A Detachment of British Troops Photographed in Action
This is Probably the First Photograph of English Soldiers in Actual Warfare
Made Since the Boer War. Note the Machine Gun in the Foreground
and the Officers Watching Farther Down the Road

GIVING GOLD FOR IRON FOR THE FATHERLAND



COPYRIGHT,

INTERNATIONAL NEWS SERVICE



Contributing Valuables to Aid the Wounded: For more than a century it has been the custom of the rulers of Germany to reward with the Iron Cross Ring those who contributed to the war funds of the nation. The German Historical Society of New York is collecting funds for the soldiers, and to those who bring jewelry, silverware or other valuables the iron ring is given as a token that the givers have aided the German cause.

54

Henry F. Kielke -

1680 2nd Av.

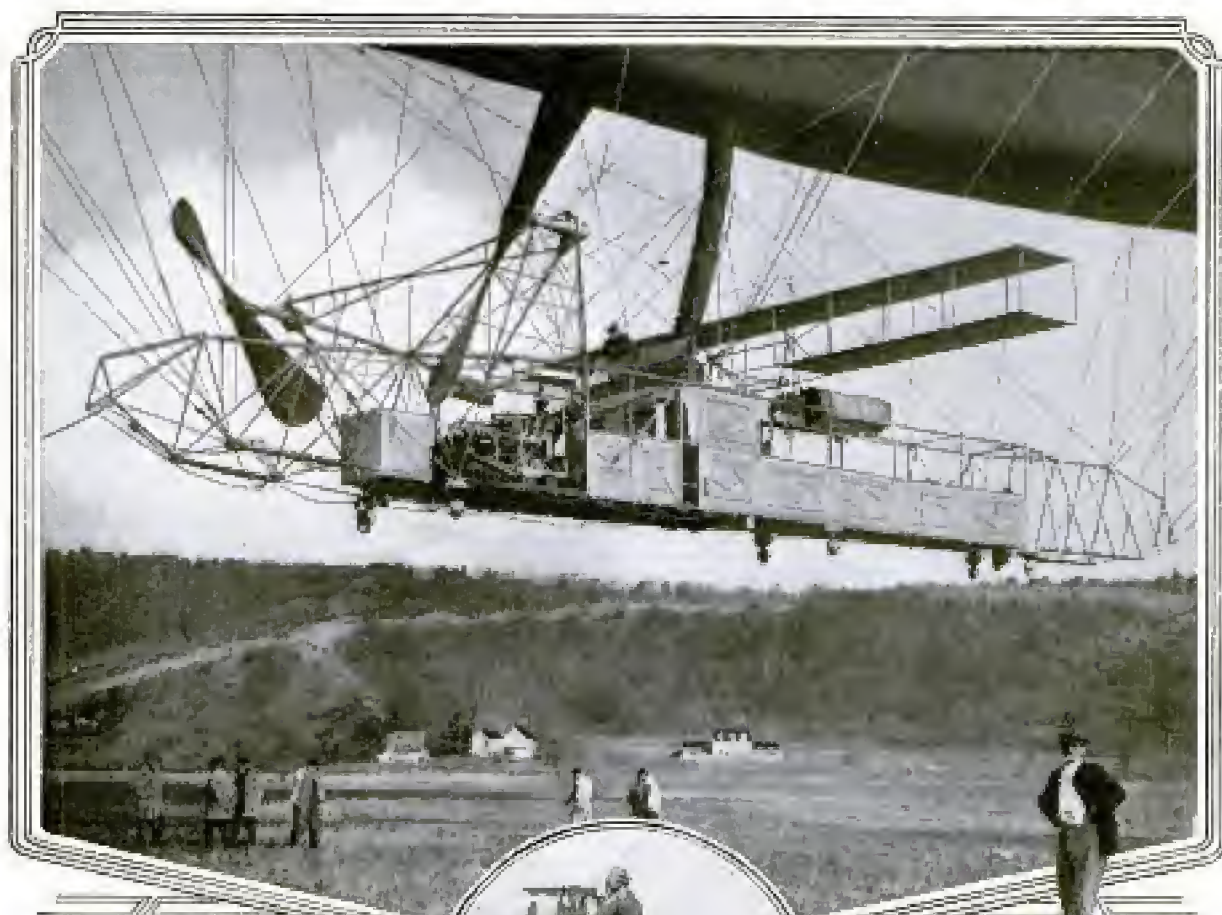
New York

Res. 302 E. 87th St.

(Rodgers, Camera & Co.)

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A FEW UNITS OF RUSSIA'S AERIAL FORCES



Above, the Dirigible "Russia," One of the Fleet Engaged in Scouting on the Austrian Frontier



Left, a Russian Tractor Monoplane with Machine Gun. Below, Russian Aeroplane Captured at Lotzen



RUSSIAN AIRCRAFT CAPTURED AT LOTZEN

STIRRING SCENES OF THE ARMIES IN ACTION



Belgian Soldiers
Fighting across
the Bodies
of Their Dead
Comrades.
A Red-Cross
Worker is
Attending a
Wounded Man
in the Ranks



An Army
Marching to
Battle: The
French Moving
against the
Germans at
Epernay.
Abandoned
German
Earthworks in
the Foreground

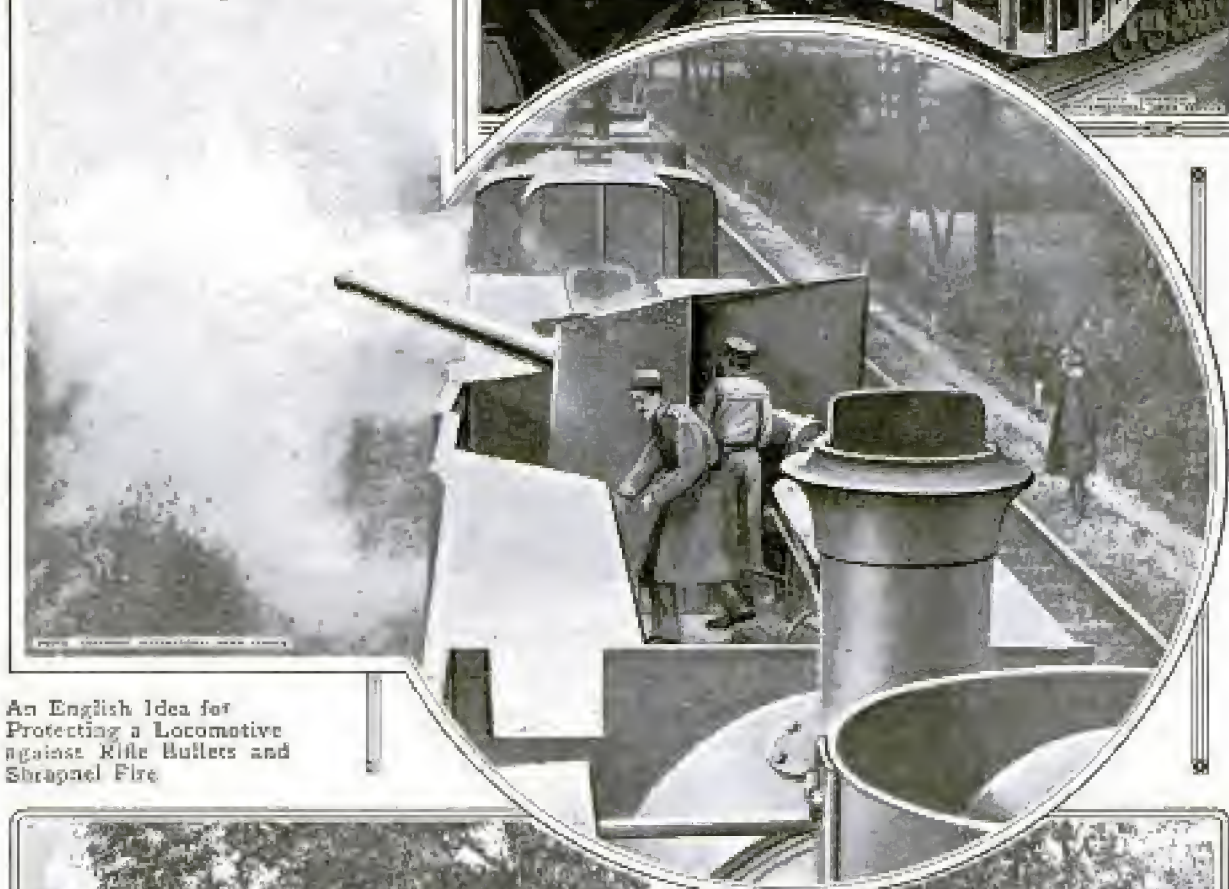
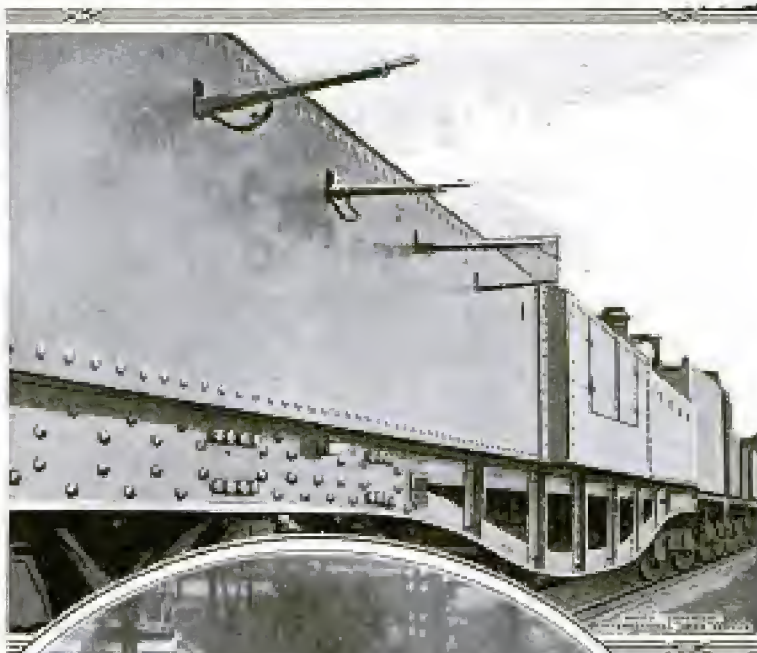
A Russian
Light Mountain
Battery Scaling
a Height in
the Carpathian
Mountains
in the
Campaign in
Eastern
Europe

ALFRED CORRIJN, LONDON & NEW YORK

THE ARMORED TRAIN AS A FACTOR IN WAR

Armored Railway Trains Built for Use on British Roads have been Taken across the Channel. The Photograph Shows One of Them at Ypres

The Belgian Armored Trains Proved of Great Value in Offensive Movements against the Germans as Well as in Moving Troops Rapidly



An English Idea for Protecting a Locomotive against Rifle Bullets and Shrapnel Fire



"THE PATHS OF GLORY LEAD BUT TO THE GRAVE"



German Prisoners of War, Guarded by Their Captors, Burying Their Own Dead in French Soil



In French Cemeteries Each Newly Filled Grave of a Soldier is Decorated with the Tricolor Flag of France

The Bodies of 48 English Seamen from the Cruiser "Cressy" Drifted Ashore on the Hook of Holland and were Buried in One Grave as Shown Below

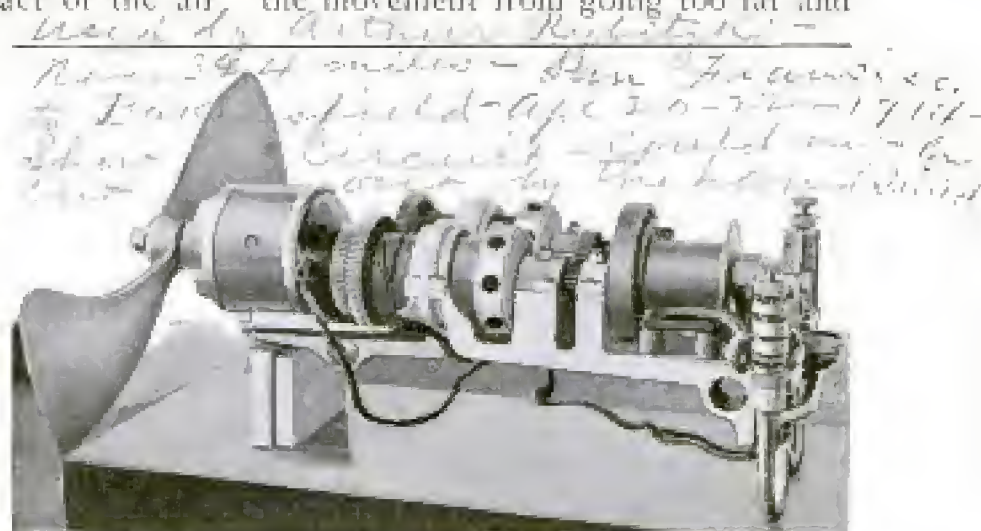


NEW AUTOMATIC STABILIZER
8438 FOR AEROPLANES

A new aeroplane stabilizer that proved satisfactory in recent races in California uses the impact of the air caused by the motion of the aeroplane to furnish power for operating the ailerons, while the action of the mechanism is controlled by the changes in level of two columns of mercury. The whole device works automatically to maintain lateral balance during straight flight, and banks the aeroplane to the proper angle in curved flight. Power is supplied by a two-bladed fan, 12 in. in diameter and shaped

like an aerial propeller, which is turned by the pressure of the air as the aeroplane moves. The shaft of this fan runs a small electric generator and passes through the generator to gears by which it operates two conical friction clutches in opposite directions. The driven parts of these clutches drive, through gear trains, the drum on which the lines that control the position of the ailerons are wound. Only one clutch can be in action at one time, so that the drum is driven in opposite directions as required for maintaining the balance, while so long as the planes are not more than one degree out of the horizontal, neither clutch is in action and the drum remains stationary. The clutches are brought into action and released by electric power supplied by the generator, and the control of this action is perhaps the most ingenious feature of the apparatus. At the end of the frame is a U-shaped tube containing mercury, and projecting down into each tube is a platinum-tipped contact pin. When the aeroplane tips, the surface of the mercury remains level and comes in contact with the pin on the low side. This completes an electric circuit, and

through this circuit the proper clutch for depressing one of the ailerons and restoring the balance is brought into action. A cam arrangement lifts the pin at just the right time to prevent the movement from going too far and



This Simple Stabilizer Maintains the Balance of an Aeroplane in Straight Flight and Banks It to the Proper Angle during a Turn

resulting in an oscillating movement of the aeroplane. In making a turn, the mercury is raised in the outer tube through centrifugal force. The resulting action is exactly the same as if that side of the machine had tipped downward, and the aeroplane is banked to correspond to the speed at which the turn is taken.

LAWS LIMIT PLACING OF SIGNS
8524 ALONG HIGHWAYS

Laws designed to preserve the beauty of the highways by preventing, as far as possible, the placing of advertising signs on buildings, trees, and stones along the highways, are now in effect in Connecticut, Pennsylvania, Massachusetts, and New York. The New York law, which went into effect recently, makes it a misdemeanor to place a sign on any tree, stone, or structure within the limits of a highway, or on any private property without the consent of the owner. It is also provided that any sign placed in violation of this law may be removed and destroyed by anyone, without resort to legal formalities.

Edward S. Cornell,
Secy Natl Highways Protective Soc.
1 W. 34th St., N.Y.C.

8598 FISH DRIVEN FROM NORTH SEA BY NAVAL BATTLES

Daily News

A curious feature of the European war is the effect that the heavy cannonading by warships has had on the fish of the North Sea. It is reported that great shoals of fish came up into the rivers and canals of Holland, leaping out of the water as they sometimes do on a summer day, and that there were swarms of fish in places where they had never been found before. It is thought that the cannonading disturbed the fish.

8630 PROPORTION OF STEEL CARS IN MAIL SERVICE

There are approximately 1,400 postal and 4,000 apartment mail cars employed at the present time in handling the United States mails, and of this number 12.33 per cent are of all-steel construction. Forty-five per cent of the former type of cars are made entirely of metal, no wood being used in any part of their construction and very little even in their furnishings. Of the apartment cars, however, only nine per cent are made of steel. All the standard postal cars now being operated by the Southern Pacific Railway are said to be of steel, while nearly 50 per cent of the combination cars used by that company are of similar construction. The average all-steel mail car weighs about 55 tons and costs between \$11,000 and \$12,000.

REPAIR BODY WITH PATCHES

8652 MADE OF RUBBER 10/15/14

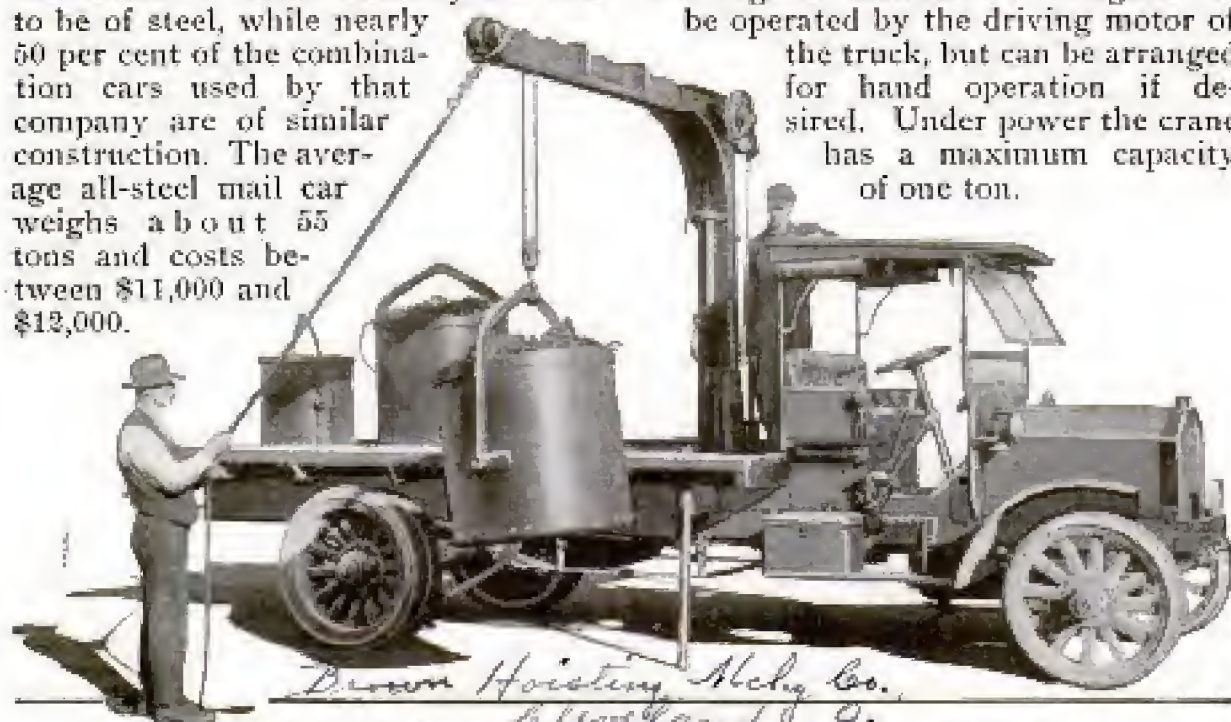
INDIA RUBBER REVIEW

Porous rubber has been used successfully by an Italian surgeon in reinforcing the muscular walls of the human body. In original experiments he inserted fine, spongelike pieces of the material in the bodies of various dumb animals, and by observation found that the granular tissues penetrated them without causing inflammation, while the wounds healed over rapidly. Later he employed the method in treating two large-area wounds caused by hernias. An X-ray examination one year after the operation showed that the rubber was in the position in which it had been placed to hold back the internal organs, and was also in perfect fusion with the tissues.

ONE-TON CRANE MOUNTED ON MOTOR TRUCK

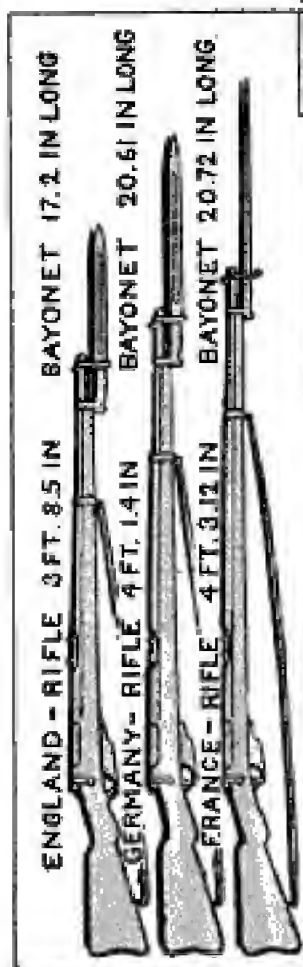
8551

A crane designed to be mounted on the chassis of any motor truck is found useful in many factory operations. The illustration shows one in use handling scrap metal in the yard of a large car works. The hoisting mechanism is designed to be operated by the driving motor of the truck, but can be arranged for hand operation if desired. Under power the crane has a maximum capacity of one ton.



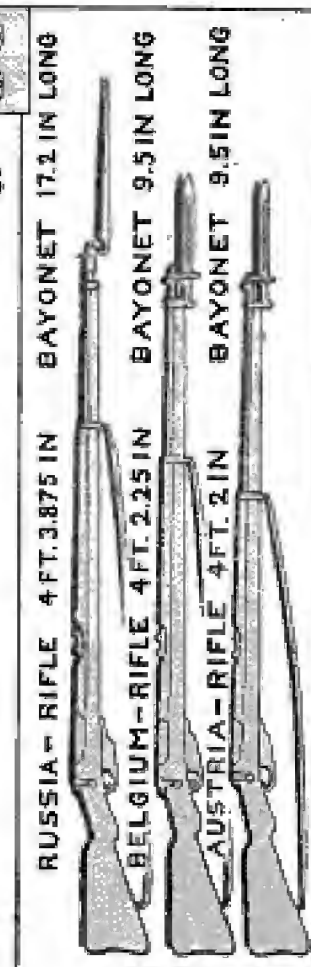
One-Ton Crane Mounted on a Motor Truck for Handling Heavy Loads

H. P. Thall, Mail Mgr., So. Pac. Co.



SMALL ARMS OF EUROPE'S FIGHTING FORCES

NO two of the European armies now engaged in war are equipped with the same rifle. The French and Austrian forces are using the largest-caliber instruments found on the continent, while the latter, at the sacrifice of velocity, is employing the heaviest bullet. The German rifle attains the greatest muzzle velocity, but this is partly on account of the fact that it uses the lightest projectile shot by any small arm in Europe. The longest rifle in service belongs to the Russian equipment, while the French have the longest bayonet, a thing which gives their weapon the greatest total length and therefore an advantage in charging. The shortest gun is that of the British army, and with the bayonet added the instrument



is still shorter than those of any countries except Belgium and Austria. Owing to the small size of the gun, however, it may be handled with ease.

The Lee-Enfield .303-caliber rifle, firing a cupro-nickel bullet, weighing 215 gr., with a muzzle velocity of 2,060 ft. a second, and using a propelling charge of 31.5 gr. of cordite, is used by both the infantry and cavalry of the British. Although experiments have recently been conducted with a sharp-pointed projectile, the round-nose bullet is still being used. The weapon is 3 ft. 8½ in. in length and takes a sword bayonet, 17.2 in. long, which gives it an aggregate length of 5 ft. 1.7 in. Its magazine capacity is 10 cartridges, which is larger than that of any other gun now being used.

The French troops carry the Lebel magazine rifle of .315 caliber, which fires a pointed bullet with a boat-shaped tail, made of a copper and zinc composition, and weighing 198 gr. The propelling charge is 46.2 gr. of nitrocellulose powder and hurls the

bullet from the rifle with a velocity of 2,380 ft. a second. In length the weapon measures 4 ft. 3¼ in., and its sword bayonet, 20.72 in., giving it a total length of 5 ft. 11.84 in. Including the bayonet the weight of the gun is 19 lb. 1½ oz., which is greater than that of the arms carried by any of the other troops. The magazine holds five cartridges.

Russian fighting forces are armed with the "three-line" Nagant .30-caliber rifle, which is 4 ft. 3⅞ in. long and uses the old-style triangular bayonet, 17.2 in. in length, giving the piece a total length of approximately 5 ft. 9 in. The ammunition carries a propelling charge of about 40 gr. of pyroxiline, which shoots a cupro-nickel shell, round-nosed, weighing 214 gr., at a muzzle velocity of 1,985 ft. a second. With its bayonet the gun weighs 9 lb. 11¼ oz., while its magazine capacity is five cartridges.

A .301-caliber Mauser rifle, firing a round, cupro-nickel shell of 219 gr. with a velocity at the muzzle of 2,034 ft. a

second, is used by the Belgians. The propelling charge consists of 37 gr. of nitrocellulose powder. In length the rifle is 4 ft. 2 $\frac{1}{4}$ in. and its bayonet 9 $\frac{1}{2}$ in., which gives it an aggregate length of 4 ft. 11.55 inches.

Germany uses a .311-caliber Mauser rifle, which fires a pointed projectile made of nickel-coated steel, weighing 154.5 gr. It uses a propelling charge of 48.4 gr. of nitrocellulose powder and throws the bullet at a muzzle velocity of 2,882 ft. a second. In length the rifle is 4 ft. 1.4 in., while the bayonet, 20.61 in. long, gives it an aggregate length of 5 ft. 10 in. It weighs 9 lb. 14 ounces.

Austria-Hungary equips its troops with the Mannlicher rifle of .315 caliber. This fires a round, lubricated-steel bullet, weighing 244 gr., which is sent from

the gun at a velocity of 2,034 ft. a second by a propelling charge of 42.44 gr. of nitrocellulose powder. The weapon is 4 ft. 2 in. in length and has a bayonet 9.5 in. long, which gives it a measurement of 4 ft. 11.5 in. in length. The magazine capacity of the gun is five cartridges, the same as that of the German Mauser rifle.

The Russian "three-line" Nagant rifle has a maximum effective range of 2,096 yd. The Belgian, French, and German rifles fire 2,187 yd. effectively. The Austrian weapon has a range of 2,132 yd. and the Lee-Enfield rifle of the British forces one of 2,100 yards.

ⒸThe pattern coin of 1776 is the rarest silver dollar in this country. Only two are known to exist, and each is valued at \$5,000.

HOW THE BRITISH ATTACK GERMAN COMMERCE

8712

I didn't think!

How many, sending Gifts to help our brave defenders, are also sending Cash to help the enemy by purchasing his wares!

Made in England.

Some facts about

14% of our male employees have joined the Colours. Re-employment has been secured to them and their dependents are being cared for by us.

ALL BRITISH!

TOILET Preparations



STEEL MAGNETS

BRITISH STEEL. BRITISH LABOUR.

ALL BRITISH TELEPHONES

The All-British TONIC FOOD.

A product of British Brains, British Capital and British Labour.

Support British Industries.

BRITISH made with BRITISH material by BRITISH labour on BRITISH Soil

Make it a British Home

PURE LARD

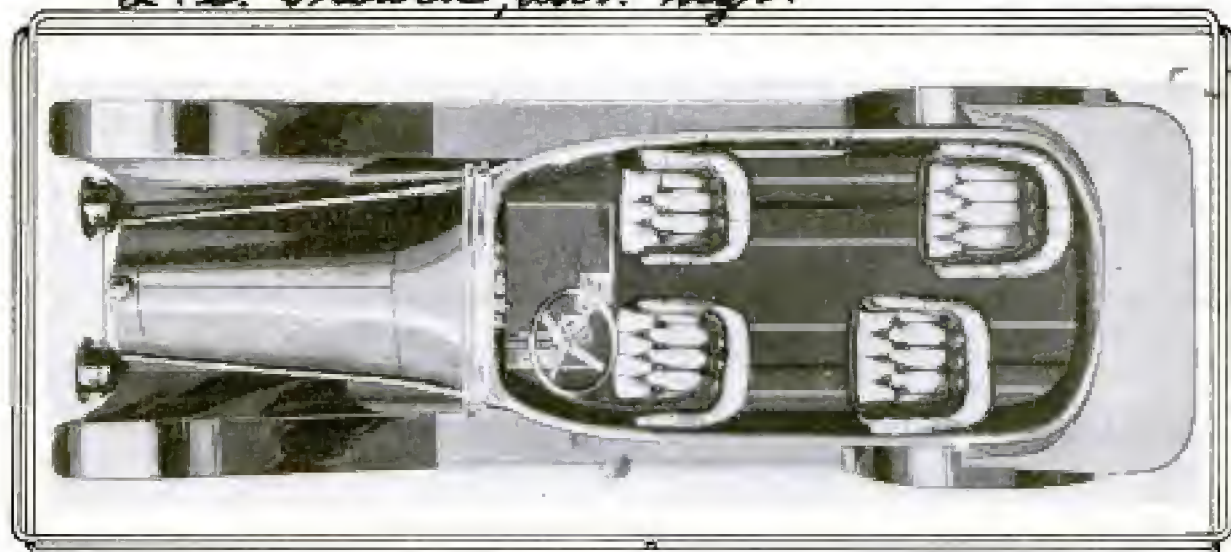
Refined in England by British Labour

A VERY important phase of the war from the British point of view is the cutting off of all commercial relations between the British empire and Germany. This is interestingly reflected in the advertising carried in English and colonial newspapers and magazines in which especial emphasis is laid upon the fact that the commodities advertised are of British manufacture. A number of advertisements bringing out this idea in various ways are shown herewith.

National Motor Vehicle Co.,
Indianapolis, Ind.

POPULAR MECHANICS
L. B. French, adv. mgr.

63



New Arrangement of Rear Seats Permitting
Sociable Grouping

NEW SEATING ARRANGEMENT 8603 IN 1915 CARS

Two interesting new ideas in the seating arrangement of an automobile have been brought out by one of the leading American manufacturers for 1915. In the four-passenger car the rear seats are separate and can be moved forward and backward on sliding tracks and also turned slightly side-wise, this arrangement making it possible for passengers to group themselves sociably and with more comfort than in the ordinary type of rear seat. In the six-passenger car the extra seats are so constructed that they fold into spaces at the rear of the front seats and are covered by leather curtains when not in use. In both types the driver's seat is separated from the front passenger seats by a passageway, so that a passenger may change from the front to a rear one at will.



Auxiliary Seats That Fold into the Rear of the
Front Seats

WEATHER FORECASTS BY 8477 TELEPHONE

Daily weather forecasts are delivered by telephone, free of charge, to about 400 farmers using the same telephone line in central Illinois, and the system has already proved of the greatest value in keeping the farmers advised of coming weather conditions. The switch-board connects with 48 party lines.

Fred Telford
605 S. Douglas Ave.,
Springfield, Ills.

Every morning, at 10:50 o'clock, all the party lines are opened, a special ring is given, and after a slight pause, to enable the subscribers to get to the telephone, the operator reads the forecast for the day furnished by the United States Weather Bureau.

¶ In 1913 natural-gas production in this country amounted to 581,898,239,000 cu. ft., the largest output ever reached.

Saul Thompson
10 Spruce St.,
New York City

Motor age 10-8-14

POPULAR MECHANICS

THROW MONEY AT CEILING 2560 TO AID RELIEF FUND

The patriotic proprietor of a public house at Camberwell, England, has adopted a clever method of raising money for the Prince of Wales National Relief Fund for the widows and orphans of British soldiers and at the same time attract trade. Customers are provided with cardboard disks, carpet tacks, and pieces of red, white and blue paper, and invited to try to make coins stick to the ceiling of the bar parlor. The tack is thrust through the center of the disk, the coin placed over the head of the tack and the paper is twisted around the whole so as to hold the coin firmly against the tack. The streaming ends of the paper serve as a "tail" to make the curious missile fly tack-point first when thrown. It takes a bit of strength to throw a coin so wrapped against the ceiling with force enough to make the tack hold, and not a little skill to project it to

a bare spot when the ceiling is already well covered with similar packets of money.

That the proportion that sticks to the ceiling is large is proved by the photograph, which shows soldiers of the Argyll and Sutherland Highlanders, on their way to the front, contributing in this manner to the relief fund.

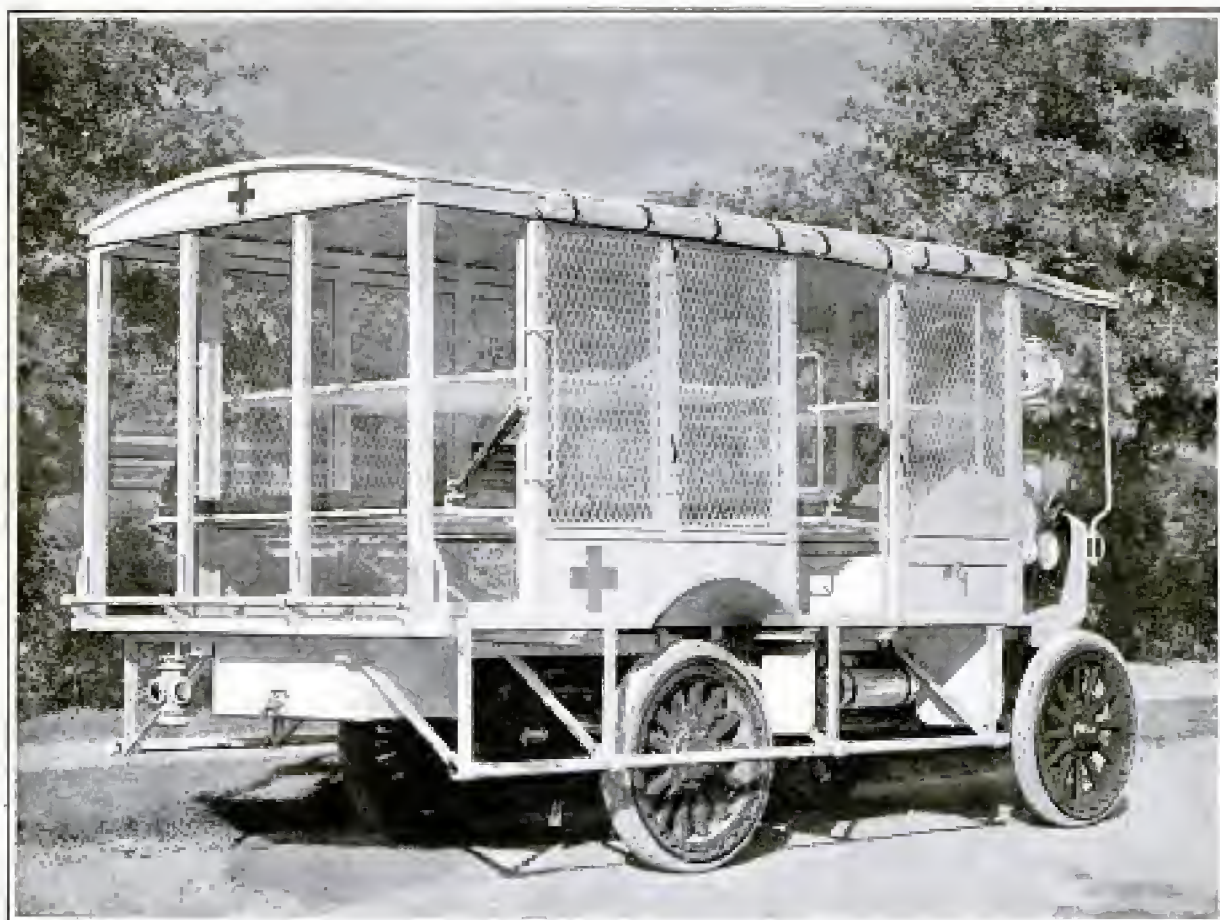
ALLIES BUY MOTOR TRUCKS IN AMERICAN MARKET

Orders for approximately 3,000 motor trucks, a large proportion of them armored and mounted with guns, have been placed with American manufacturing concerns during the last few weeks by the French and Russian governments. Before the contracts were awarded, demonstrations lasting several days were made at South Bethlehem, Pa., by representatives of practically all the large firms in this country. Delivery will be made at some point in Canada.



PHOTO BY PAUL THOMPSON

Throwing Money at the Ceiling to Help the Prince of Wales National Relief Fund



An American-Built Motor Ambulance, Capable of Carrying 14 Patients, Which has been Sent to Europe

AMBULANCE OF NEW DESIGN BUILT FOR RED CROSS

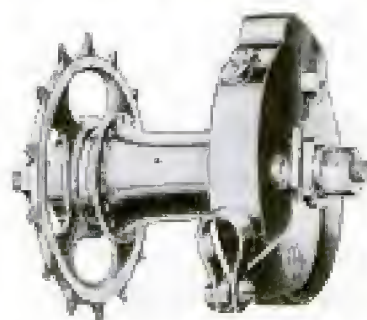
8348

Designed for use on the battle fields of Europe, a motor ambulance with provision for the accommodation of 14 patients was recently constructed in this country and shipped abroad for the Red Cross Society. The body of the vehicle is divided laterally into compartments formed by welded-steel netting. Entrance to these, instead of being through the customary rear door, is afforded at the side, the screened ends of each compartment being hinged so that they may be opened without disturbing the wounded in the other sections. In placing an injured soldier in the ambulance, the stretcher is lifted to the compartment, pushed in, and then locked in place. At the rear of the machine is a tank in which a quantity of drinking water is carried, while space for surgical supplies is provided elsewhere.

FRICTION BAND BRAKE MADE FOR BICYCLE USE

8348

Among the bicycle accessories announced for the new year is a brake which provides a strong gripping surface that will stop a wheel, but not lock it. The device consists of a friction band which extends around the circumference of a revolving drum within a housing on the rear axle. By back pedaling, this band is contracted so that it grips the drum in accordance with the pressure exerted upon it. The brake is in reality a miniature of the band brake which has been used on motorcycles, but is new in its present application.



The Miami Cycle & Mfg. Co.,
Middletown, Ohio.

motorcycling Sept. 24, 1914

DUTCH WINDMILL LARGEST OF KIND EVER BUILT

At Barradeel, in Friesland, a windmill which is generally believed to be the largest of its kind in the world, is



This Huge Steel Windmill Which Drains a Marsh in the Netherlands Is 39½ Feet in Diameter

being used to drain a 1,850-acre tract of marsh which has been redeemed by the construction of embankments along the sea. The mill is built all of steel, with the exception of the floor and platform, while its wheel is 39½ ft. in diameter and carries 30 blades. The framework is similar in design to that of the Eiffel tower at Paris, and is slightly less than 53 ft. in height. The motor performs its work without re-

quiring attention other than an oiling once a week, the adjustment of its mechanism being so arranged that it performs its functions automatically. When the wind has a velocity of approximately 10 ft. a second, the motor is able to displace about 318 cu. ft. of water a minute, while this is increased to approximately 1,059 cu. ft. when the wind is blowing 17 ft. a second.

PRESERVATION OF FRUITS FOR EXHIBITION

Besides being a disinfectant, formaldehyde, when in an aqueous solution, is capable of preserving fruits for exhibition purposes for periods of several years. Apples, pears, and nearly all varieties of plums, grapes, and similar fruits, may be kept in their natural color and shape by covering them with a two-per-cent solution of formalin, which is made by putting one part of the chemical in solution with 50 parts of soft water. Pears have been preserved in this manner for periods of five years during tests made at the Oklahoma Agricultural Experiment Station.

In handling softer fruits, such as peaches and apricots, the preserving fluid is made with double strength, and five per cent of glycerin is added. Care should be exercised in picking the fruits and attention given that there is no moisture on their surfaces before they are placed in the solution. For the sake of appearance, the stems with a few leaves attached, should be left intact.

Oklahoma Agricultural Experiment Station

W. L. G. et al.

Copyrighted material

Section can be cut by hand, without a

Handkerchief - metal wire

Handkerchief

Handkerchief of paper, etc.,
West of 21st St. of
the Thomas, etc. (Hand)

Oklahoma Agricultural Experiment Station
Oklahoma Agric. & Mech. Coll. Bldg.
Stillwater, Okla.



How Three New
Locomotives
Looked After
Being in a Snow-
drift for a Week

BIG LOCOMOTIVES BURIED IN SNOWDRIFT

Three freight locomotives were completely buried in a snowdrift during a blizzard while standing in a yard at Schenectady, N. Y., and it was necessary to dig them out before they could be moved. The condition of the locomotives after they had been hauled from the drift is shown in the illustration. These were new locomotives that had never been in service, and had just been made ready for the "messengers" who were to accompany them to their destination on the purchasing railroad, when they were buried in the drift and snow-bound for a week.

VIBRATORY CHAIR MOUNTED ON RUBBER BALLS

A recently constructed vibratory chair, which is intended to stimulate the tissues and muscles of the body, is mounted on rubber balls in such a manner that its tremors are not communicated to the floor or surrounding objects. When the apparatus is in operation, its vibrations usually number approximately 3,600 a minute,

while it is possible to control the strokes so that they are either long and heavy, or short and faint, as is desired. By means of foot vibrators which are placed at the rear of the chair, application is given to the lower limbs.



This Vibratory Chair is Mounted on Rubber Balls to Prevent the Communication of its Impulses to the Floor

Frank C. Perkins
Erie Co., Savings Bank Bldg.
Buffalo, N.Y.

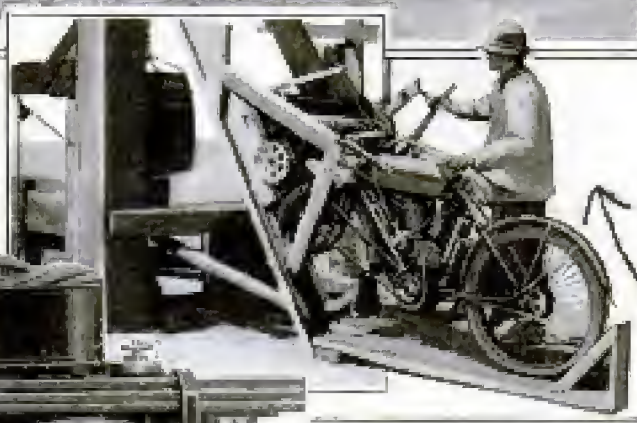
8579
U. P. Stroganoff & Family
Richmond, N. Y.
 Emblem Mfg. Co. Angola N.Y.
 fitted with E. Clipper Machine Co. Clutch &
 the speed equipment
 SOME UP-TO-DATE MOTORCYCLE NOVELTIES,
 8579
 N. E. Galt & Family
 of Emblem Mfg. Co. E. Angola
 N.Y.



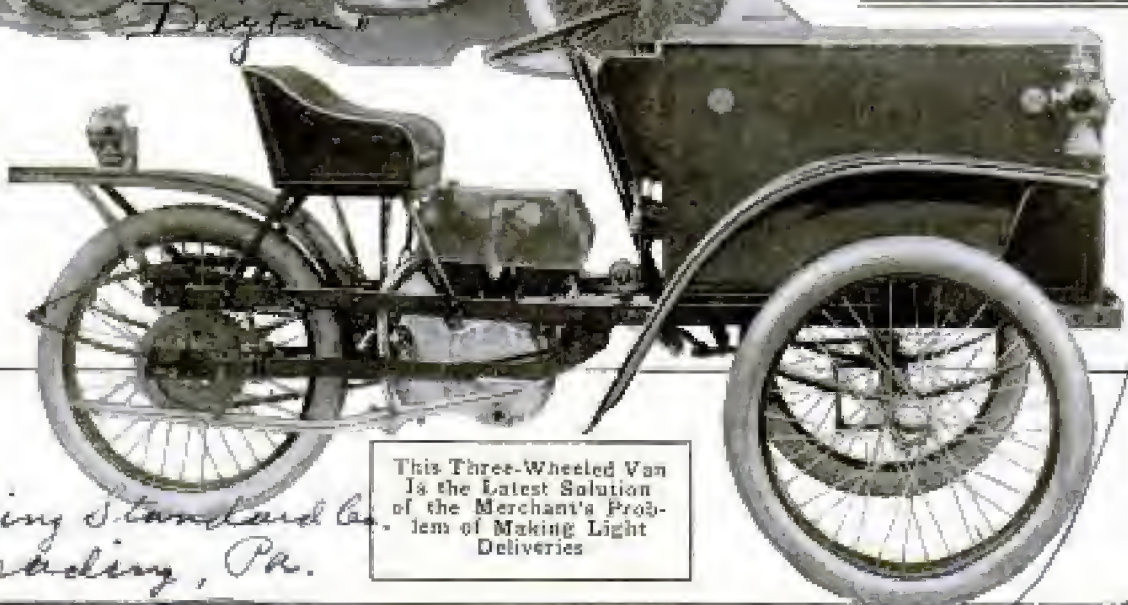
Davis Derriving Machine Co.
Dayton, O.



This Three-Wheeled
 Car is Fully
 Equipped for Fire-
 Fighting. It Car-
 ries a 35-Gallon
 Chemical Appara-
 tus and Makes a
 Speed of 45 Miles
 an Hour



The Owner of This
 Motorcycle Rides to
 Work on It Every
 Morning and Then
 Rigs It Up, as Shown,
 to Furnish Power for
 Hoisting Water



Reading Standard Co.
 Reading, Pa.

This Three-Wheeled Van
 Is the Latest Solution
 of the Merchant's Prob-
 lem of Making Light
 Deliveries

Mr. Jerry Mowley (T. E. Harriott claims on the "Reno"
 Chippewa Creek property)
 Colo.
 H. Mies Manda E. Walsh 418 W. Eaton Av. C. C.
 Copyrighted material
 Cat!

8-579 ✓ ~~8-577~~

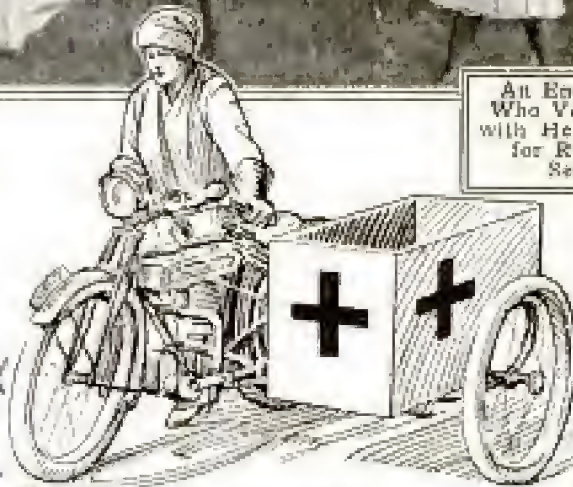
ALSO A FEW NEW IDEAS IN SIDE CARS



How a Family of Four
Toured the American
Continent on a
Motorcycle

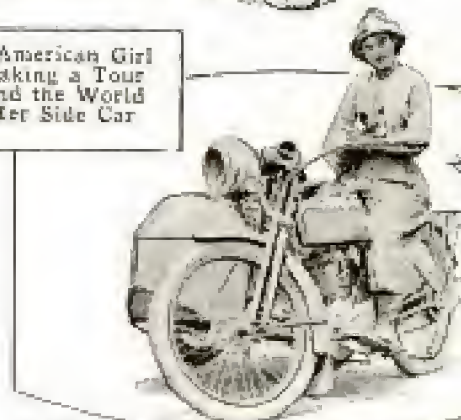


This Little Garage, Made of
Galvanized Iron and Fastened
Together on the Inside, is
the Last Word in Conven-
ience for the Motorcyclist



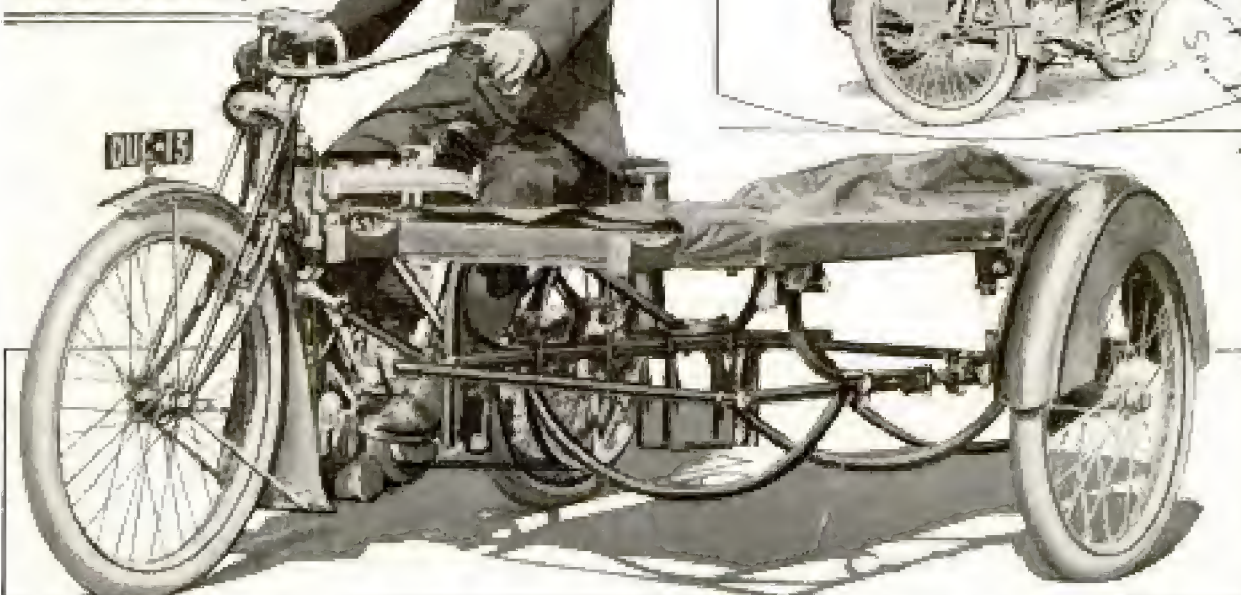
An English Girl
Who Volunteered,
with Her Side Car,
for Red-Cross
Service

Handwritten note:
Kendall, Dr.
motorcycle ambulance
Oct 22, 1914.



This American Girl
is Making a Tour
around the World
on Her Side Car

Handwritten note:
Miss Della Coe
Sept 1914
H. V. N. Coe
Sept 1914



Side Car Built for Red-Cross Work: It is Specially Designed for Carrying a Stretcher

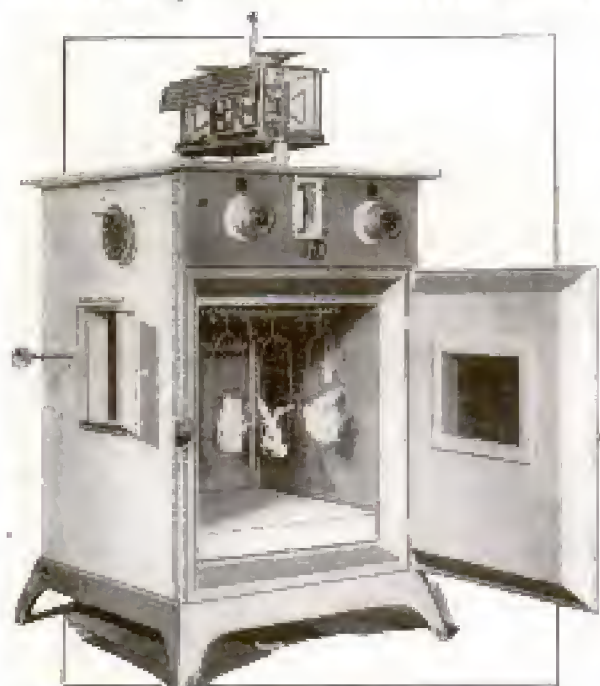
R. H. Hamilton
1231 E. Ma Millan
Cincinnati
Ohio.

POPULAR MECHANICS

OVEN USED IN DETERMINING DUTY RATE ON TEXTILES

8246

In order to simplify the process of determining at various seasons of the



This Oven is Used by the Custom Inspectors in Determining the Duty to be Placed on Imported Cotton Yarns.

duty to be charged against imported cotton yarns, an electric conditioning oven has been constructed for the use of inspectors at the New York custom-house. Cotton-yarn count changes with the humidity of the air, which necessitates the establishment of a standard, if the same rate is charged at all times. The oven, in which a constant standard atmospheric condition is maintained, eliminates the difficulty from this operation. Testing baskets are suspended within this apparatus, while a rod connects with a balance scale on top. By means of an outside lever, the material in any one of the baskets may be brought under the balance and its weight and yarn number determined.

ROPE FERRY FOR CROSSING NARROW CHANNEL

8255

The owner of a small island in Newport Bay, Cal., has devised a simple rope ferry which he uses in ferrying parties of as many as six or seven persons across the narrow channel that separates his home from the mainland. The ferry consists simply of a small



Rope Ferry Used for Crossing Narrow Channel That Separates Island from California Mainland

V. W. Killick
1521 Oak St.

Glendale, Calif.

Copyrighted material

E. H. Thomas
120 Broad St.
Kennett Square, Pa.

POPULAR MECHANICS

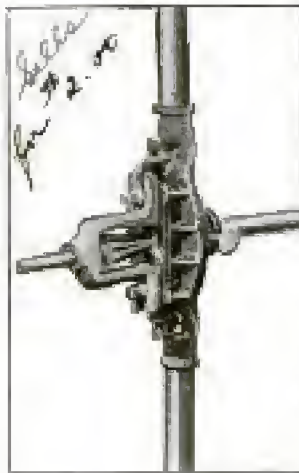
71

Chas. Thomas (Inventor) same add.

float having a platform and handrail. A wire stretching from the island to the mainland and permanently fixed at both ends runs through upright guides on the float and serves to guide it across the water. The float is pulled from one landing to the other by a person standing on the float by means of a second cable which has each end attached to the float and which doubles back through a sheave located on each shore. Both cables are placed at such a height that they do not interfere with rowboats and launches using the channel.

PIPE THREADED AND REAMED # 7547 AT ONE OPERATION

A new device designed to facilitate the work of the plumber is a reamer attachment for a pipe - threading tool. This attachment is U-shaped, and is secured to the threading tool by bolts, as shown. It is provided with an opening through which the shank of the reamer projects and a setscrew for holding the reamer rigid.



With this attachment the threading and reaming of the end of the pipe can be done at one operation.

MOTOR CAR IS CONVERTED # 8194 INTO SAWMILL

Outlasting by several years its usefulness as a family vehicle, an antiquated motor car has been put to work sawing wood in the timber lots near Lewistown, Pa. For some time the machine has been employed as a portable sawmill by its owners who transport it under its own power from place to place where there is timber to be worked. The only remodeling required

consisted in constructing a mounting at the front of the car for a circular saw, which is driven by the engine.



A tool box was built at the rear, and when severe usage put an end to the tires, wooden ones were cut to fit the wheels, and fastened in place.

INKSTAND ATTACHMENT # 7191 FILLS RULING PEN

The usual method of filling a ruling pen is to insert a brush or ordinary pen carrying the ink, which is taken up by adhesion and held between the nibs. A new inkstand for draftsmen reverses this process and is provided with nibs between which the ruling pen is inserted. This attachment is fixed to the under side of the hinged stopper and projects into the inkwell when the stopper is down. When the stopper is raised the nibs come up filled with ink.



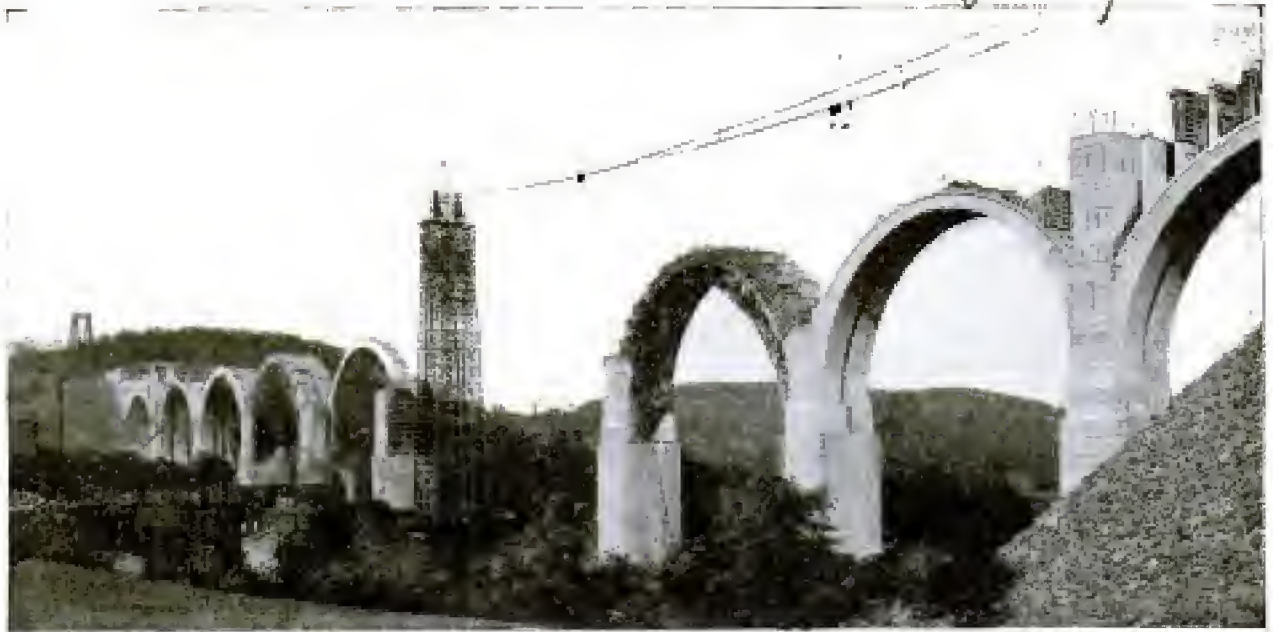
In using, it is only necessary to insert the ruling pen, which fills quickly, and then wipe the sides of the pen to clean off the surplus ink.

E. Ellsworth Chesley
Lewistown, Pa.

G. H. Greene,
Lane Tech. High School
Chicago

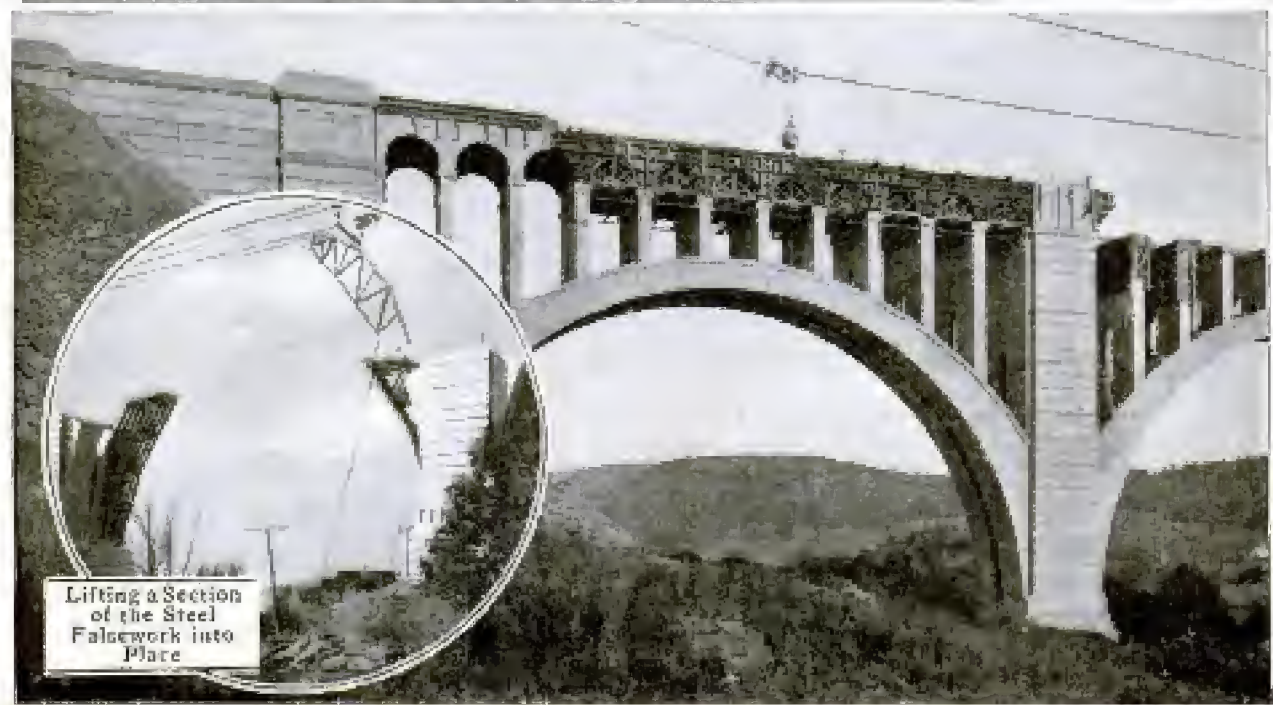
Copyrighted material

James Fuster, Adv. Agent, D. L. & W. R. R. Co.,
 70 West St., N.Y. City



Material for
 the Viaduct
 is Hauled by
 Cableways
 Which are
 Supported on
 Steel Towers

Left:
 The Falsework
 for the Concrete
 Construction
 Consists of Sets
 of Steel Trusses
 Spanning
 the Spaces
 between Piers



Lifting a Section
 of the Steel
 Falsework into
 Place

PHOTO BY D. L. & W. R. R. CO.

Tunkhannock Viaduct Nearing Completion: The Abutment End is Finished, While the Span at the Right has

BUILDING THE TUNKHANNOCK 8345 VIADUCT

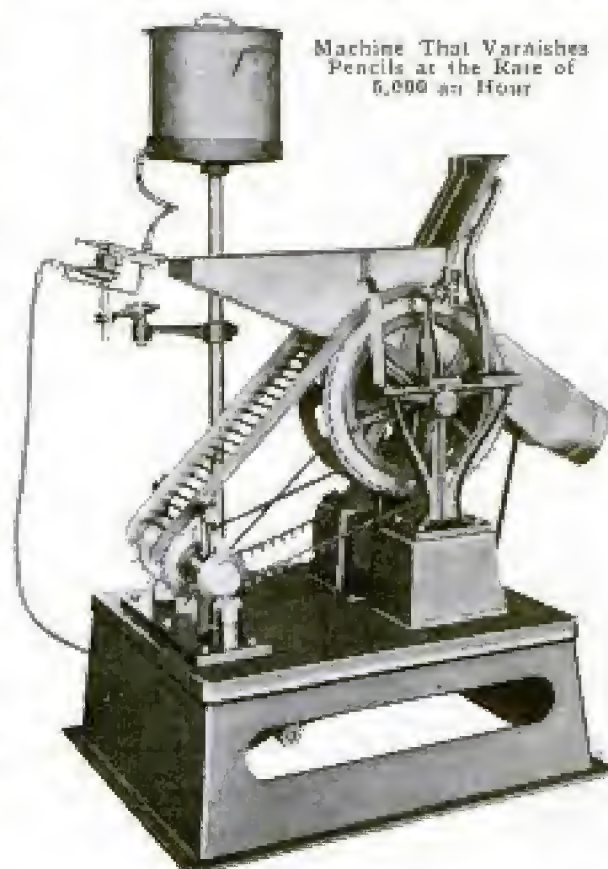
What is said to be the largest concrete bridge in the world is the reinforced-concrete railroad viaduct now under construction across the valley of Tunkhannock Creek, 22 miles west of Scranton, Pa. This bridge has a total length of 2,315 ft., an extreme height of 242 ft. above the bed of the stream, and 300 ft. above the solid-rock foundation, and is being built to carry two tracks. It is made up of 12 semicircular arches, ten of which have a span of 180 ft., and two, a span of 100 ft. These arches will be surmounted by small arches on which the solid concrete surface of the viaduct will be carried. Even the falsework for the bridge is of a massive character, consisting of sets of arched steel trusses, spanning the spaces between piers. These were made in sections in the shops and erected by means of a double cableway. The viaduct will contain 167,000 cu. yd. of concrete, and 2,280,000 lb. of reinforcing steel, while the excavation for the piers amounted to about 43,500 cu. yd. All the piers rest on solid rock, two having foundations 95 ft. below the surface.



been Made Ready for Arches That Support the Roadway

PENCILS VARNISHED AT HIGH 8390 RATE OF SPEED

A new machine that applies a smooth coating of varnish to pencils, and performs the operation continuously at a



high rate of speed, has recently been developed. The unvarnished pencils are placed in the hopper at the top of the machine, as shown in the illustration, and are then picked up by the endless chain which carries them through the varnish spray produced by an air brush. The endless chain is so made that the pencils are rotated as they are carried along, so that the whole surface receives an even coating of the spray. The varnished pencils are then carried to the lower part of the machine where they are deposited on drying racks. This machine has a capacity of 5,000 pencils an hour.

A branch of the United States Patent Office will be opened at San Francisco in order to issue certificates of proprietorship for owners of patented exhibits at the Exposition.

J. C. Mumm, 1039 East 66th St. Chicago

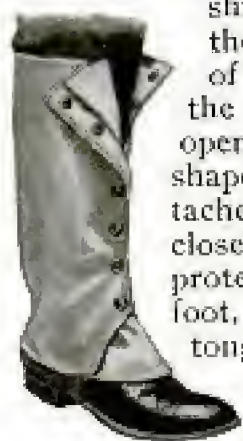
Patentee: W. E. Woodward
Malden, Mass

India ⁷⁴ Rubber World

POPULAR MECHANICS

NEW LEGGING MADE TO 8449 PROTECT INSTEP

A new legging made of rubber-coated waterproof material is designed not only to protect the leg and ankle, but to shield the upper portion of the foot against the access of rain and snow through the laced or buttoned opening of the shoe. A flap, shaped like a spat and attached to the leg portion, fits closely over the instep and protects that portion of the foot, and above this a tongue extends to the top of the legging. The flap is held in place by a strap that passes under the shoe between the heel and tread. The legging opens in front and can be folded compactly and carried in the pocket when not in use.



BURIAL GROUND FOR PETS OF 8136 WEALTHY FAMILIES

Tucked away in one corner in Montevideo, Uruguay, is a small, carefully kept cemetery which illustrates to what extremes persons of some nationalities will go in expressing sentiment. This burial ground is maintained for

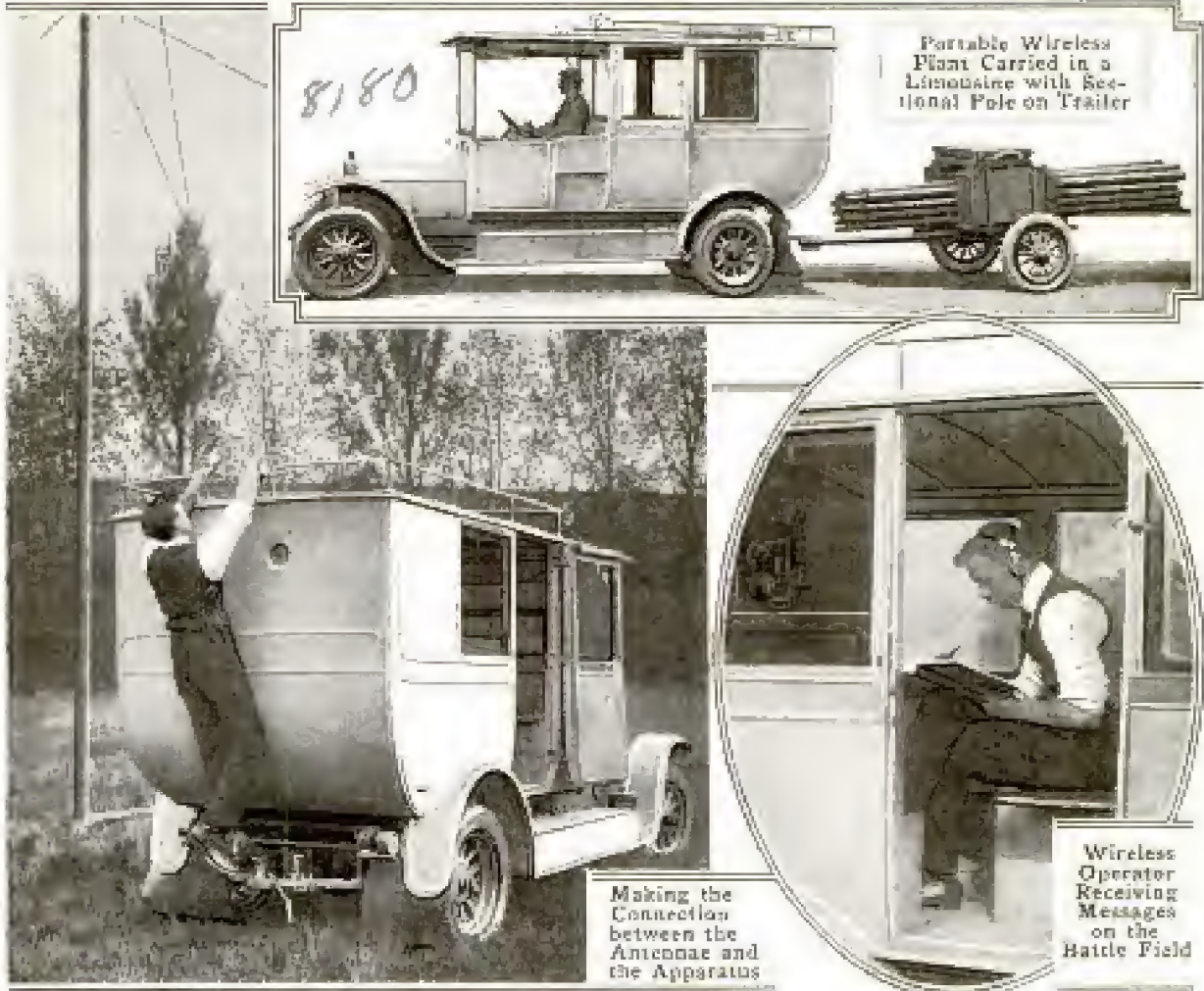
the interment of animals, receiving the deceased pets of wealthy families, who often pay somewhat lavish fees for a small plot of ground. While in some cases the graves are supplied merely with headstones, there are many of them which have substantial monuments. It is not infrequently the case that these plots are looked after almost as carefully as if they held the bodies of human beings. There are dogs and monkeys, parrots and cats, and various other animals, resting beneath tombstones, their names inscribed in granite or marble, and their graves adorned with flowers.

ARMY RADIO PLANT BUILT 8180 IN LIMOUSINE

Pronounced attention has been manifested by the powers of Europe in fitting the signal corps of their armies with efficient means of wireless communication. The use of motor cars in this connection has been quite general, although recent. The British fighting forces are using a portable radio station on the field which is built in a car with a limousine body, and so far as outward appearance is concerned it might easily pass through the streets of a city without attracting attention. The instruments are compactly arranged in



Montevideo Cemetery for the Pets of Wealthy Families of Uruguay



the rear part of the machine in the space ordinarily occupied by the back seat. A trailer cart, which is rubber-tired, carries the antennae poles, which may be jointed together and erected in a few minutes after a stop is made. The operator as well as his instruments is afforded protection during unpleasant weather, while the car is of a type capable of taking roads that would be impassable to trucks.

NEW PROCESS OF WELDING 8649 ALUMINUM WIRES

Aluminum has so great an affinity for oxygen that when exposed to the air it almost instantly becomes coated with a thin film of aluminum oxide. This film protects the aluminum from further combination with the oxygen so that no damage is done to the metal, but this chemical action makes aluminum one of the most difficult metals to

weld, as the welding cannot be done by ordinary processes quickly enough to prevent the forming of the film on the surfaces to be welded. A new process developed for welding aluminum wires apparently overcomes this difficulty. It consists in impacting the wires end on, while an electric condenser is allowed to discharge between the surfaces. Heat sufficient to raise the temperature of the wires above the melting point is developed in a small fraction of a second, the air is forcibly expelled from between the surfaces, while the impact drives the molten ends into each other before they have time to oxidize. By the time the impact is over, the electrical discharge is complete and the weld finished. The heat is rapidly absorbed into the body of the wires.

¶The balance-wheel shaft of the average watch makes approximately 236,682,000 revolutions a year.

Electrical World

10-17-14

8185 POWERFUL TESTING MACHINE FOR STRUCTURAL MATERIALS

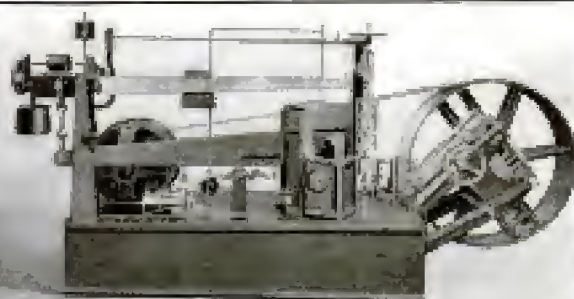
What is said to be the most powerful compression-testing machine in the world forms part of the equipment of the U. S. Bureau of Standards at Pittsburgh, Pa. This machine, which is operated by hydraulic power, is capable of exerting a pressure of 5,000 tons and is used for determining the

strength of iron and steel beams, concrete blocks and columns, and other structural materials. Pieces to be tested are placed between two steel blocks or "heads," each 6 ft. square and 2 ft. thick. The upper head is stationary during a test, but is easily moved up or down, by an electric motor, along the enormous steel screws that form the corner posts of the machine, and in this way is adjusted to any height required by the size of the piece being tested. The pressure is applied through the lower head which has a piston working in a cylinder placed below the floor. The operation consists simply in forcing this piston up by water pressure. The entire machine weighs about 100 tons. The test pieces are handled by means of a 20-ton crane.



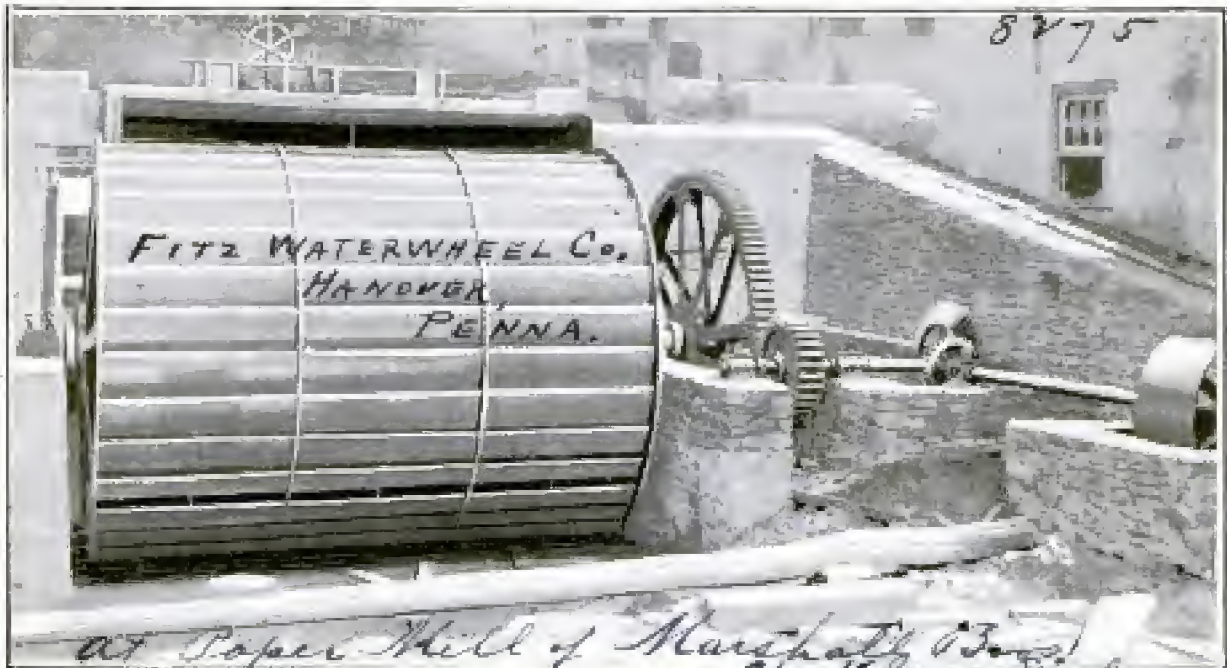
8275 "OVERSHOOT" WATER WHEELS AS AUXILIARY POWER

Steel water wheels designated as "overshoot" wheels, to distinguish them from the old type of overshot water wheel, are fast coming into use at places where the quantity of water and the head are too small for a turbine, and where the water power is to be used as an auxiliary to steam power. To operate efficiently, a turbine requires a head of about 60 ft., and a flow of as much as 3,000 cu. ft. per minute, but since the operation of the "overshoot" wheel depends almost entirely on the weight of the water, it can operate with a small quantity of water and under a head no greater than the diameter of the wheel, while its speed can be adjusted to that of the engine to



This Testing Machine, Used by the United States Bureau of Standards, Is Capable of Exerting a Pressure of 5,000 Tons

H. M. Phelps, Box 73, Stokes Station, Washington, D. C.
made by the Timina Olsen Testing Machine Co., 500 N. 12th St., Philadelphia, Pa.



Steel "Overshoot" Water Wheel, 13 Feet in Diameter, Used as an Auxiliary to the Steam Plant of a Paper Mill.

which it acts as an auxiliary. The buckets are made of steel and not only utilize the impact of the water as it comes from the chute, but are curved to retain the water until the bucket has nearly reached its lowest point. The latter feature alone gives this wheel a greater efficiency than the wooden overshoot wheel, which begins to spill the water when the bucket is about halfway down. Owing to the fact that steel is a good conductor of heat, the steel wheel soon takes the temperature of the water flowing over it and does not get clogged with ice readily in cold weather as does a wooden wheel. The successful operation of these wheels requires a steel chute equipped with a water-tight steel gate for regulating the flow of water.

OUTDOOR-SLEEPING DEVICE

8402 TAKES PLACE OF PORCH

Taking the place of a screened-in porch, an outdoor-sleeping bunk has recently been invented which is designed to be attached to the exterior of a building. The framework of the device is made of steel and three of its sides are protected by a wire netting which extends around them. It is supplied with an awning and heavy

adjustable side curtains which make it rain-proof and suitable to be used in severe as well as pleasant weather. The inner edge of the frame fastens to the studdings of a wall by screw hooks and hinges, while the outer side is supported by four steel rods screwed in place near the top edge of the awning. The berth is placed over a window opening, and during cold weather this may be kept closed so that a sleeper can step into a comfortably heated room upon rising.

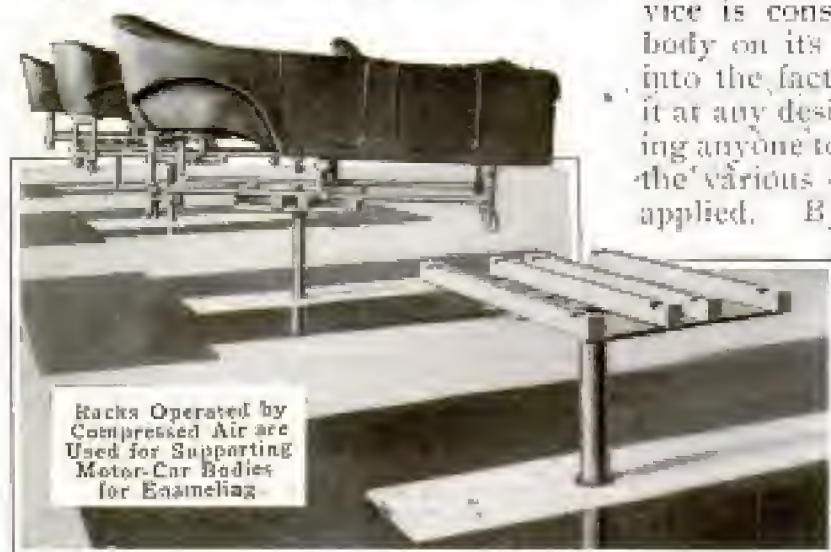


An Outdoor-Sleeping Device Which may be Attached to Any Building

*Kewanee Mfg. Co.,
Kewanee, Ills.*

SWIVEL LIFTING RACK FOR MOTOR-CAR BODIES

8433 To eliminate the necessity of handling a motor-car body in order to



Racks Operated by Compressed Air are Used for Supporting Motor-Car Bodies for Enameling

porting rack has been invented which operates by compressed air. The device is constructed so that it lifts a body on its truck when it is wheeled into the factory paint shop, and holds it at any desired height without requiring anyone to place hands upon it while the various coats of enamel are being applied. By turning a valve, the piston which supports the frame may be raised or lowered at will. Since the rack turns on its base, the car may be swung by a workman in any direction, in contrast to the method, formerly employed, of having a gang of men lift the work, which

change its position while it is being painted and varnished, a swivel sup-

often resulted in its being marred or soiled.

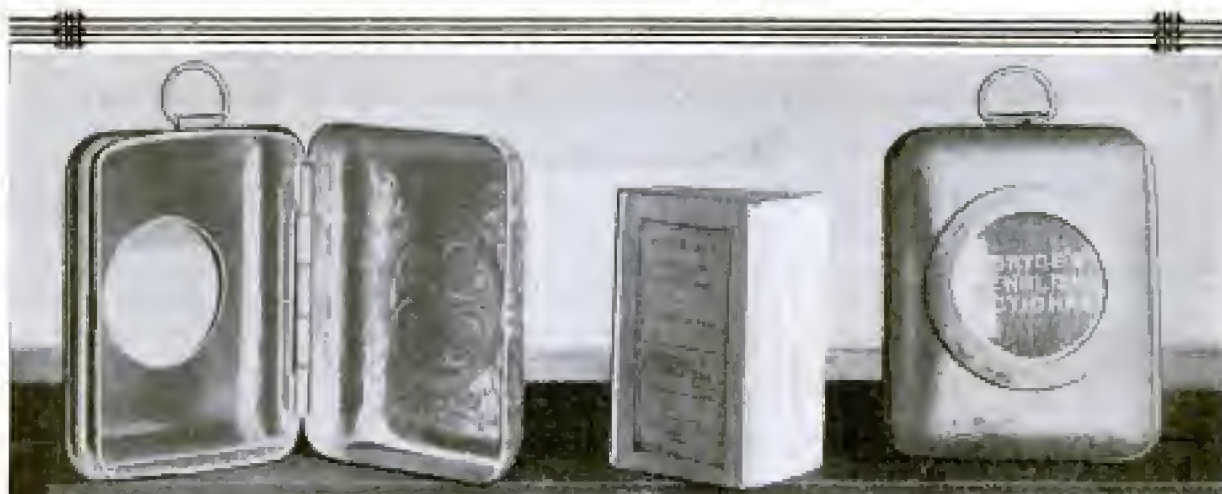
LIBRARY OF THE SMALLEST BOOKS IN THE WORLD

8464 One of the interesting exhibits in the Congressional Library at Washington is a collection of about 200 miniature books, the largest of which is less than two inches square. These books are all reproductions on a miniature scale made possible either by the photoengraving process or by photographic reproduction. The smallest book in the collection is a copy of the "Rubaiyat" of Omar Khayyam rendered into English verse by Edward Fitzgerald, and having pages that measure about $\frac{3}{8}$ in. on each side. This tiny book is a photographic reproduction containing 48 pages, and is bound in a fabric resembling that used for window shades. To read the book it is necessary to use a strong magnifying glass. The smallest printed book in the collection is a volume of the letters of Galileo, the astronomer. This book has a paper binding and measures $\frac{3}{4}$ in. by $\frac{1}{4}$ in. The reduction was made by the photoengraving process.

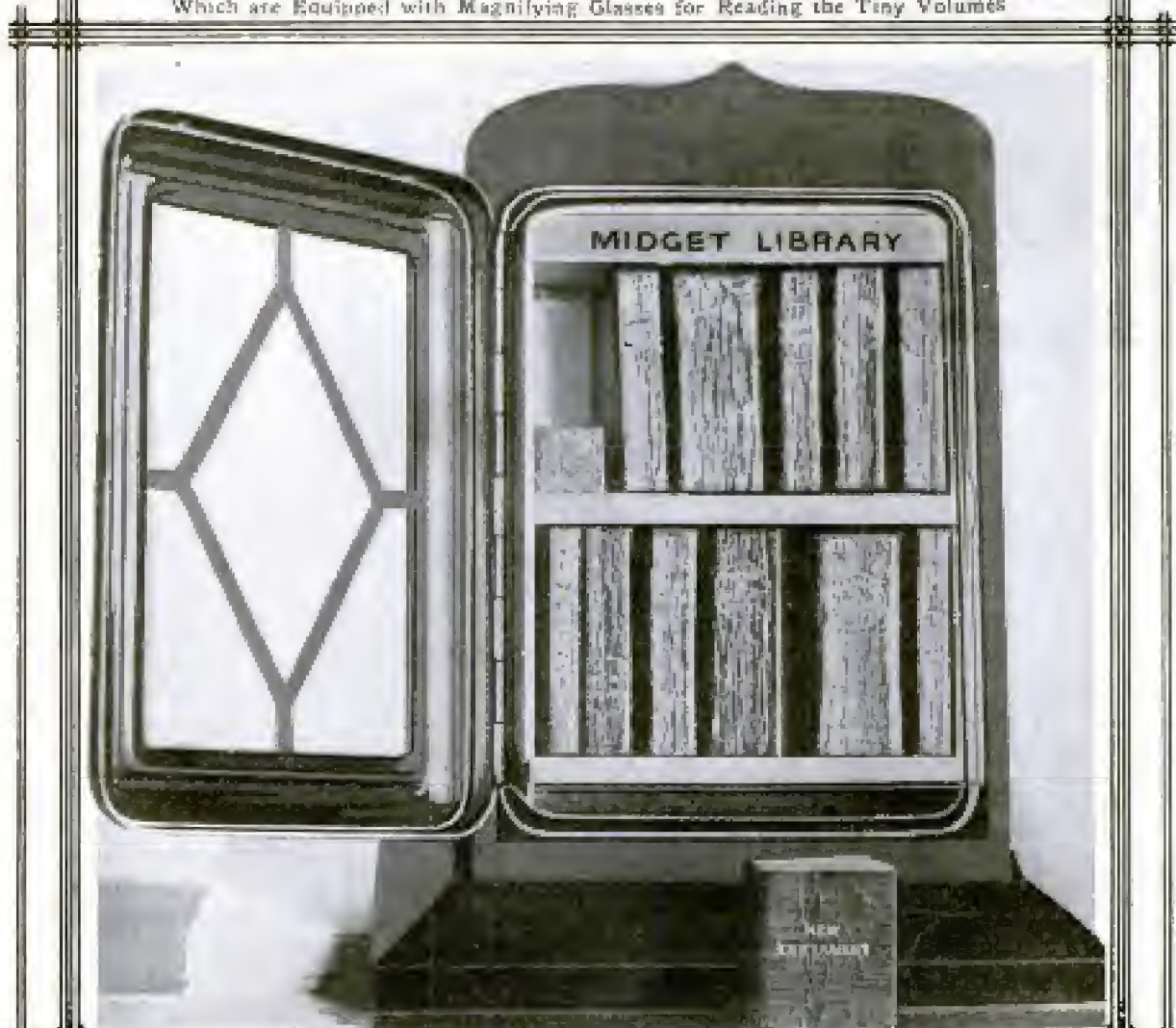
By far the most interesting feature of the collection is a midget library of 11

books, among which are the New Testament, the Koran, an English dictionary, the first edition of Burns' poems, a French-English dictionary and a German-English dictionary. All of these volumes are bound in red morocco with gold lettering, and several of the bindings are tooled. The smallest of the 11 books is the New Testament, which measures $\frac{3}{4}$ in. by a little more than $\frac{1}{2}$ in. along the sides, and is $\frac{1}{4}$ in. thick. Two of the volumes of this midget library, the copy of Burns' poems and the English dictionary, are incased in watch charms, in the front of each of which is a small but powerful magnifying glass necessary for reading the tiny book. In the collection are also an illuminated copy of the Koran in Arabic, less than $\frac{1}{3}$ in. thick, a red and gold copy of the "Divine Comedy," having for its frontispiece a picture of Dante; a copy of Goethe's "Die Leiden des Jungen Werthers" (The Sorrows of Werther), $1\frac{1}{2}$ in. square and about $\frac{3}{4}$ in. thick, and other standard works of history, poetry, science, and fiction.

J. C. Mc Carthy, The Evening Star
Wash. D.C.

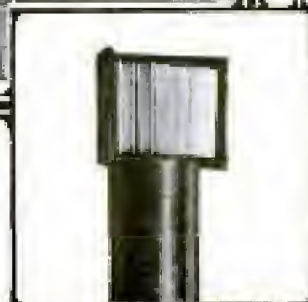


Bayce's English Dictionary and the Poems of Robert Burns are Carried in Watch Charms, Which are Equipped with Magnifying Glasses for Reading the Tiny Volumes



These Pictures Show the Actual Sizes of Some of the Volumes in the Wonderful Collection of Miniature Books in the Library of Congress at Washington

The New Testament Shown Above Is Part of the Midget Library Containing 11 Standard Works. At the Right is the Rubaiyat of Omar Khayyam Supported on the End of a Lead Pencil, and at the Left is This Book Placed beside the New Testament



Patented: Victor Alexander
53 Clarence Gate Gardens
Baker St. London, W.

80 also

POPULAR MECHANICS

WAITER-SIGNALING DEVICE 8325 FOR CAFE TABLES

To contribute to efficient table service in hotel dining rooms and cafés, a signaling apparatus has been devised



for attracting the attention of different waiters and indicating the desires of a patron. It consists of a stand carrying three electric lights, each of a different color. These are operated by push buttons which are to be used when a waiter, head waiter, or wine server is wanted at a table. Once flashed, a light remains burning

until a diner has received attention, the servant extinguishing it by means of a switch at the top of the appliance when he answers a call. It is intended in this manner to overcome much of the inconvenience often experienced in calling a waiter after one has been partly served. The head waiter is enabled to tell at a glance whether or not he is wanted and whether any patron is not being shown attention.

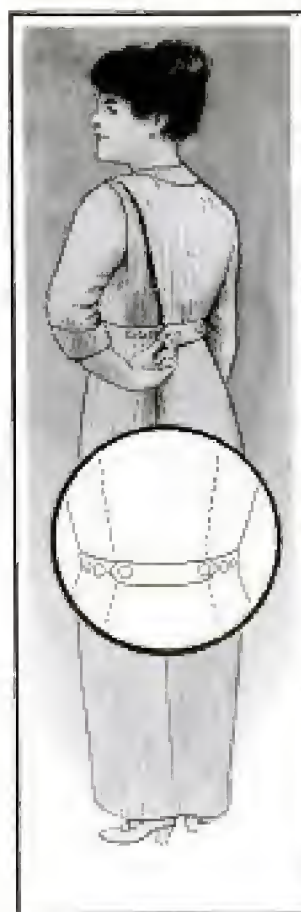
PLAN TUNNELING UNDER BAY 8342 AT SAN FRANCISCO

Plans for the construction of a system of rapid-transit tubes beneath San Francisco Bay to connect Oakland and San Francisco were recently made public by engineers who have had the problem under consideration for several years. Thousands of persons employed in the exposition city reside outside of it, many of them across the bay in Oakland, or its suburbs, and are forced to rely upon ferry service for transportation. At best this is

slow and more or less inconvenient, and has given rise to an agitation for the tunnels. The plans contemplate the building of four tracks, each in a separate bore, some four miles in length. Estimates have been based on steel-and-concrete construction and a building level at about 12 ft. below the bottom of the bay. In the event of the construction of the system the trains would be essentially the only medium of ventilation afforded, but since these would operate in only one direction in each tube, it is considered that the air circulation they would naturally create would be adequate for the needs.

READY-MADE DRESS FITS 7930 VARIOUS-SIZED WOMEN

To make it possible to fit different forms with ready-made clothes without



necessitating alterations, a one-piece dress has been patented which by a series of buttons may be changed into a variety of sizes. In the back it has a loose panel, held in place by a band which may be fastened to a range of buttons at the waistline. This allows the dress to be let out, or taken in, as is needed, a slight adjustment at the waist varying its size.

The deposits in the postal savings banks were increased by \$4,200,000 during August, 1914, the largest gain in a single month since the system was established.

Arch Macdonald
280 Lee St.,
Oakland, Calif.

Barnum Brothers Co.,
Buffalo, N.Y.



COPYRIGHT, BROWN & OGDON

Stanford, Conn.
Diving from a High-Speed Hydroplane to Put Thrills in the Movies

DIVING FROM HYDROPLANE 8088 LATEST MOVIE FEAT

Leaping overboard and taking to the water from a swiftly moving hydroplane requires no mean skill, since a slight slip, too deep a plunge, or an off-angle dive might easily result in a broken back. A motion-picture producer recently filmed a photoplay in which the heroine makes a spectacular escape from "kidnapers" who are driving away with her in a high-power hydroplane. While the craft skimmed over the water at a rate sufficient to leave the waves churning in its wake, the movie actress made her plunge, striking the surface in a manner which did not result seriously for her but added realism to the picture.

LONG-RANGE GUN RECORD 8466 OVER TWELVE MILES

What is said to be the longest measured range ever attained by a gun projectile, a matter of tremendous importance in the present war, was made in 1892 by a projectile fired from a Krupp 9.45-in. gun. The actual measured range in this firing was 22,120 yd., or a trifle over 12½ miles. No record was made of the muzzle velocity.

Army & Navy Jour.

UTAH JUNIPER STUBS FOR 8367 ELECTRIC-LINE POLES

The practice of using Utah juniper stubs as a support for pine and fir-timber telephone and electric-transmission poles is becoming an established practice in Utah. The Utah juniper is a species of cedar that is particularly resistant to decay, but is usually too stunted to serve as a complete telephone pole, while the pine and fir timber rot



quickly at the ground line. By combining the two, a strong and durable pole composed of native timber is obtained. The juniper stub is firmly set in the ground, and the pine or fir pole is then securely lashed or clamped to it.

Contrary to the general belief there is no Federal statute prohibiting the use of the United States flag for advertising purposes, but 31 states have enacted such a law.

*Written by Jimmy V. Wright and submitted by
Ernest Adams, U.S. Forest Service, Wash. D. C.*

POTASH DEPOSITS FOUND IN CALIFORNIA INSURE FUTURE SUPPLY OF FERTILIZER

8657
IN many respects the most vitally important result of the outbreak of hostilities in Europe, so far as the United States is concerned, was the shutting off of the supply of potash from the great German kali mines. Potash is one of the essential fertilizing ingredients, without which millions of acres of land now under cultivation would be almost worthless, that has not been commercially produced in the United States. It is also extensively used in the manufacture of glass and soap, in making gunpowder, and, as potassium cyanide, in photography. For many years the entire world has been depending upon Germany for its potash.

For four years the United States Geological Survey, as well as many privately capitalized groups and individuals, has been searching for American sources of potash supply. Attention has been often called to the giant kelps of the Pacific coast, the potash content of which can be readily extracted, and at least one commercial organization has been formed to exploit this source of supply. Only such natural deposits as are found in the Stassfurt mine, in Germany, however, would be adequate to fill the great and growing demand. And such deposits have at last been found in the United States.

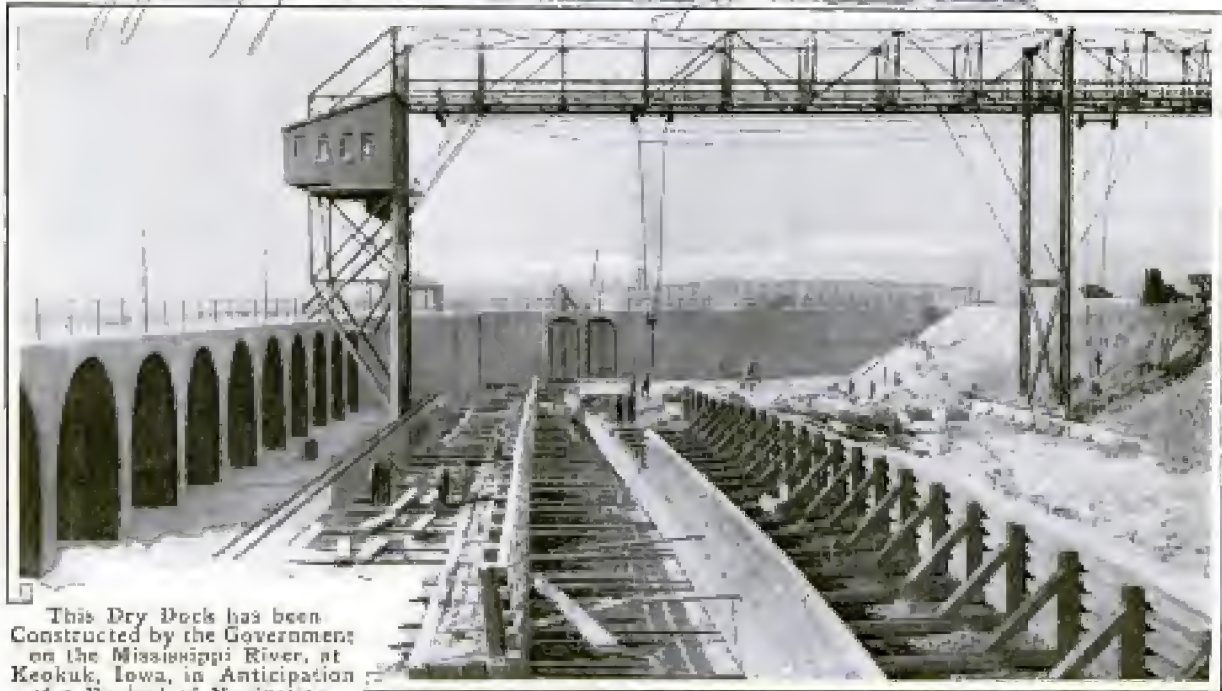
The efforts of the geological survey were rewarded soon after the war began by the discovery of a deposit of potash, estimated at 10,000,000 tons, at Searles Lake in Death Valley, California. According to an announcement by Franklin K. Lane, secretary of the interior, the mining of this potash is about to be begun at the rate of 120 tons a day, or 37,440 tons a year. This rate of production is expected to be increased rapidly. The imports from Germany for several years have been at the rate of 300,000 tons annually.

This newly discovered Searles

Lake deposit consists of a smooth plain of crusted salts, underlaid by a bed of salt and brine to a uniform depth of about 75 ft., and extending over an area of at least 20 square miles. The potash is contained in the brine which saturates the entire deposit in the form of potash chloride, being about four per cent by weight of the brine. Other valuable chemicals are also found in the deposit. According to the experts of the geological survey and of the Bureau of Soils of the Department of Agriculture, the Searles Lake potash is of a very high commercial standard. Being near the Pacific coast it can be shipped to the Atlantic seaboard and Gulf ports by way of the Panama Canal at a low cost for transportation.

In order to enable farmers to obtain the fertilizing element of potash until the new American deposits have been developed to a point where the full demand can be supplied, the Department of Agriculture has issued a bulletin telling how farmers may use wood ashes for this purpose. These may be profitably applied as a top dressing to grass land and pastures, and may also be used for corn and root crops. Cottonseed-hull ashes are stated to be much more valuable as a fertilizer than wood ashes.

Another highly important fertilizing element, in fact the most important of all, is nitrogen, and a large proportion of the nitrogen fertilizer used in America has also been obtained in the past from Germany in the form of sulphate of ammonia, which is a by-product of the coal-tar industries. Ammonium sulphate, however, is also produced in America, and several large concerns are now giving more attention than ever to the utilization of this valuable by-product, while the Searles Lake deposits also contain appreciable quantities of this fertilizing salt.



This Dry Dock has been constructed by the Government on the Mississippi River, at Keokuk, Iowa, in Anticipation of a Revival of Navigation

LARGE DRY DOCK IS BUILT 8250 FOR MISSISSIPPI BOATS

In anticipation of a revival of freight traffic on the Mississippi River, as well as for the accommodation of Federal boats, the government has constructed a large dry dock at Keokuk, Iowa, adjoining the recently built dam, which is considered one of the most thoroughly equipped fresh-water ship basins in this country. It is 463 ft. in length and 150 ft. wide, providing adequate facilities for several vessels at one time. The large traveling crane which was used in building the dam has been installed at the dock, where it will be utilized in various capacities in the repair and construction of ships. Nearly a dozen buildings are being erected to house the machine shops, mills, and other plants, which will be operated in conjunction with the ship basin.

Reinforced concrete has been used extensively throughout the work, all the retaining walls and similar structures being constructed with it.

Representatives of the French government now in this country are reported to have authority to purchase 100,000 horses for military purposes.

OLD SWORDS ARE MADE INTO 8488 PLOWSHARES

In order to emphasize the suggestion that the recent signing of peace treaties between the United States and several other nations was a step toward the time of which the prophet Isaiah sung, when "they shall beat their swords into plowshares," miniature plowshares actually made from old swords were distributed as souvenirs by the secretary of state among those who witnessed the signing of the treaties. The swords



Miniature Plowshare Made from Sword Blades to Commemorate Signing of Peace Treaties

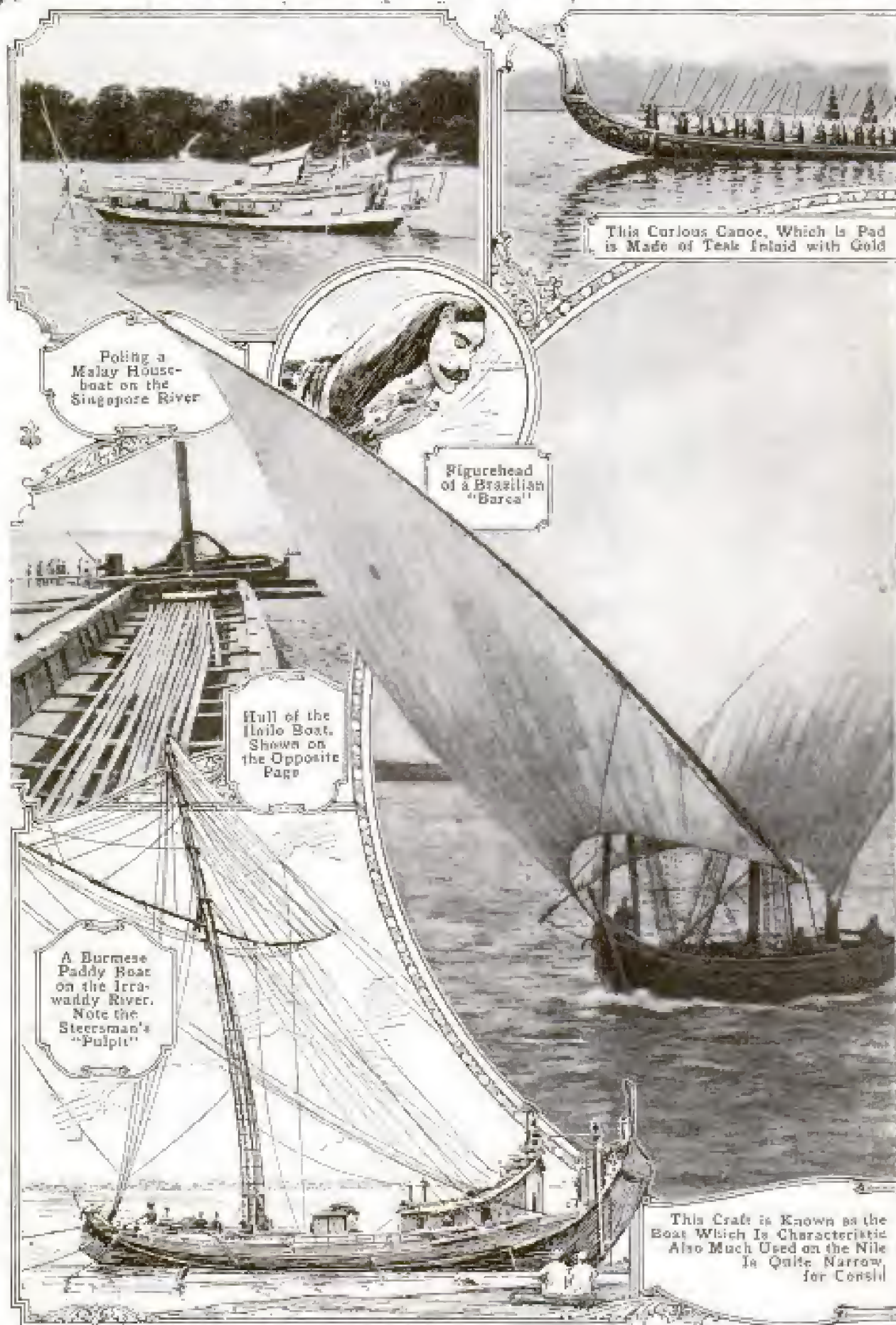
were furnished by the War Department from the stock of condemned and obsolete weapons. The plowshares, nickelplated, are intended for use as paper weights.

Clipping from Chicago Tribune

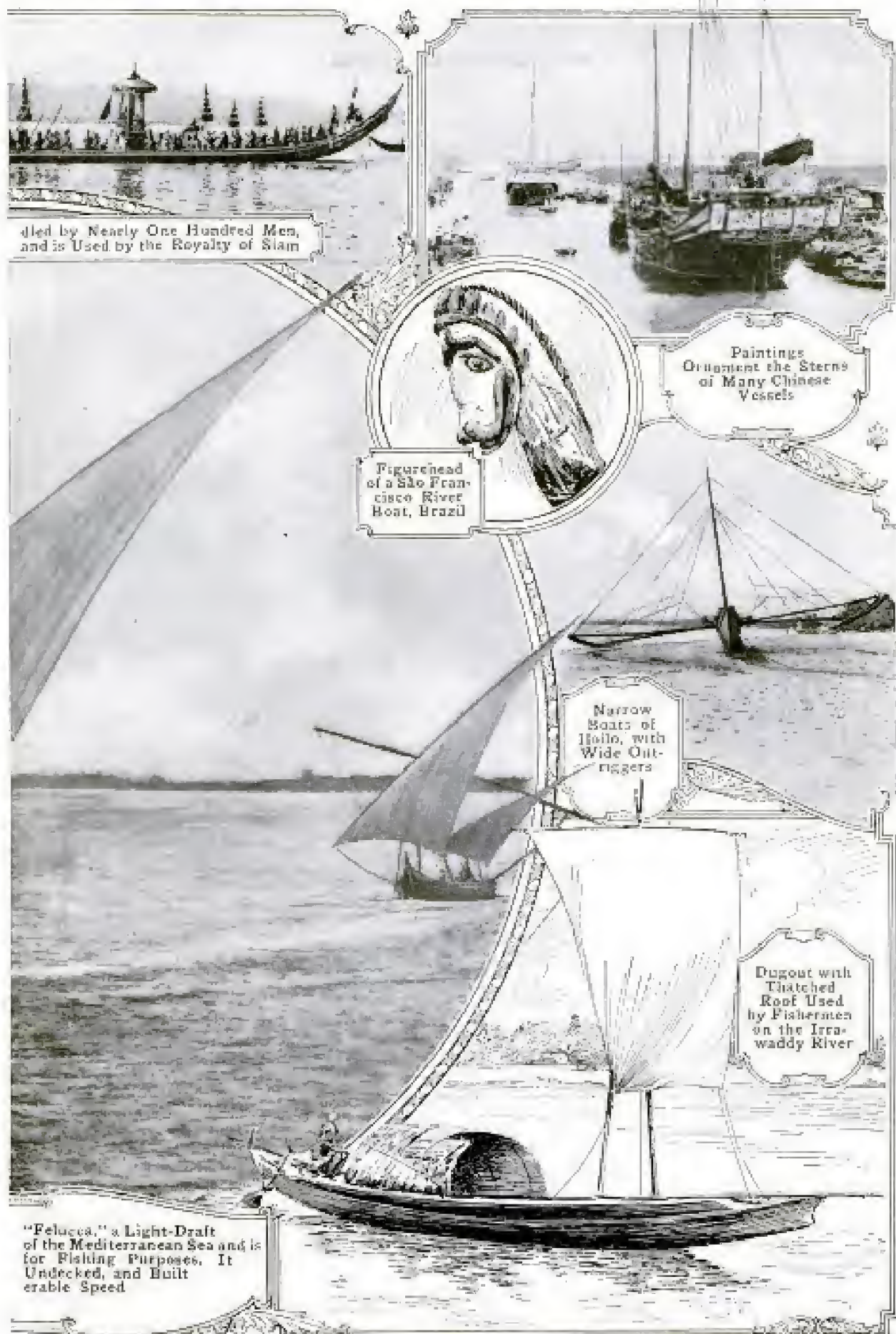
Jerauld Wright, 24 Park Place
Newark, N.J.

7538

PICTURESQUE AND CURIOUSLY BUILT BOATS



PLYING THE RIVERS OF VARIOUS COUNTRIES



H. D. Jones
908 Walnut St.
Philadelphia
86 Pa.

POPULAR MECHANICS

COLLECTING CIGARS FOR 8495 GERMAN SOLDIERS

In order to provide "smokes" for the soldiers in the field, the German Red



How the German Red Cross Appeals for Cigars for the Soldiers

Cross Society has placed in prominent positions in various German cities

boxes into which the charitably disposed are invited to drop cigars for the use of their compatriots at the front. Thousands of cigars are thus collected daily and sent to the battle fields for the solace of the men in the trenches.

ODD LOCKS ARE DESIGNED

8648 FOR HOTEL ROOMS Hotel World 10-10-14

Door locks governed by four different sets of keys are being designed for the guest rooms of an Omaha, Neb., hotel. When a chamber is occupied and the door locked from the inside, it will be proof against even the master key, but when turned from the outside, the lock may be opened by the latter. The third key will be capable of locking the door against the occupant of the room so that in case it is not desired that he should enter, he may be prevented from so doing. The emergency key, which will be kept by the house manager, will unlock any door in the building.

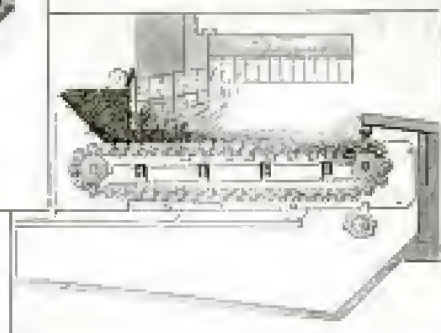
8424 AUTOMATIC STOKER MADE OF REVOLVING DISKS

An automatic stoker now being introduced consists of an endless chain that carries the coal from a hopper back into the furnace after the manner of a chain-grate stoker, but differs from that type in that it is made up of closely spaced disks mounted on bars which rotate as they move along the bottom of the fire box. As the disks revolve, there is no chance for clinkers to stick to the grate, with the result that there is no serious plugging of the air spaces, while the continual movement keeps the fuel bed even and in a free state, and there is no necessity for

a high draft pressure. As the ashes sift through between the disks they are caught on an apron and are carried back by the return side of the grate to a plate at the front of the furnace, which is conveniently placed for the removal of the ashes. A side gate regulates the amount of fuel fed into the furnace.



This Stoker Works Like an Ordinary Chain-Grate Stoker but is Made Up of Closely Spaced Disks Mounted on Rotating Bars



Power 10-6-14

Keystone Stoker Co.
141 Milk St., Boston, Mass.

POPULAR MECHANICS

87

Laclede Gas Co., St. Louis, Mo.
GAS LAMP SIXTY FEET HIGH

THROWS LIGHT FOR MILES

8347

One of the largest—if not the largest—gas lamps in existence was installed recently on the top of a St. Louis building, where it is used for advertising purposes. It is more than 60 ft. in height and its light has a strength of approximately 900,000 cp. When illuminated it resembles a large incandescent mantle inclosed in a globe



This Gas Lamp, 60 Feet High, and of Approximately 900,000 Candlepower, Serves as an Advertisement for a St. Louis Gas Company

similar in form to those commonly used on upright gas burners. Instead of coming from a mantle, however, the light is given off by several clusters of gas arcs arranged within a cylinder made of opalescent sand-blasted glass which was molded in sections over a

form similar in shape to that of a mantle. This is 40 ft. high, a little more than 8 ft. in diameter, and stands in the center of a chimney 10 ft. wide. An artificial cooling apparatus is employed to overcome the heat from the burning gas. The lamp is lighted by means of a pilot light which ignites the gas in the arcs when it is turned on.

PROTECT CANAL-ZONE FORTS WITH WIRE ENTANGLEMENTS

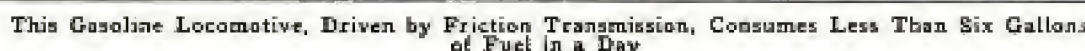
8646

Heavy barbed-wire entanglements are to be constructed around the fortifications at Panama Canal to form obstructions against the advance of an enemy in time of war. In the 1914 appropriation bill covering the defense of the Canal Zone, there is an item of \$7,500 for the purchase of 2,500 coils of wire. Much of this, it is understood, will be placed through different parts of the jungles, making an approach in front of the forts next to impossible.

Christian Science Monitor

10/8/14

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FRICION TRANSMISSION FOR
No. 1 - SMALL LOCOMOTIVE

Friction transmission is employed on a small four-wheel-drive gasoline locomotive which is being constructed for industrial purposes such as clay working. A fiber wheel operates in contact with a friction disk, carrying the power by chain to a jackshaft from which it is directed to the front and rear axles. There is a flexible connection between the friction-disk shaft and the engine which relieves the strain upon the latter. The advantage claimed for the transmission system in this use is that when a heavily loaded train is starting, sufficient slippage may be allowed until the locomotive pulls out easily, thus avoiding a heavy strain upon gears and shafting in starting. The locomotive has a drawbar pull of about 800 lb. when traveling five miles an hour, which means that it can haul a 20-ton load at that speed on a level grade.

CA method recently invented makes it possible to record wireless signals on a telegraph wire or plate.

86⁴⁵ Information from Library HOW THE WARRING NATIONS HONOR HEROES

EVERY nation honors its heroes of war by conferring decorations, usually medals, upon soldiers who have distinguished themselves in battle, but the Victoria Cross of Great Britain is the only one which is gained by valor alone. It was originated by Queen Victoria during the Crimean War and is presented for acts of exceptional bravery performed in the presence of the enemy. It is not graded, but is given



The Victoria Cross



The Iron Cross

founded by Frederick William III of Prussia and consists of a cast-iron Maltese cross edged with silver. It is presented for distinction in battle, although not exclusively for individual bravery. The grand cross, which is of double size, is given to officers of high standing who have been victorious in a hard campaign, or have fought bravely on the defense.

In France, unusual performances of

to all ranks alike in both the army and navy. It consists of a bronze Maltese cross attached by a letter "V" to a bar on which a sprig of laurel is embossed. In the center of the badge is the royal crest and beneath this the single inscription "For Valour."

The Iron Cross of Germany was

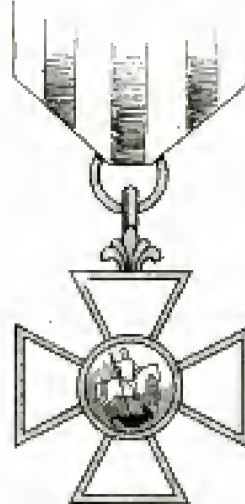


Cross of the Legion of Honor

military merit are rewarded by the cross of the Legion of Honor, which was established by Napoleon, in 1802. The order is divided into five classes which are known as the grand cross, grand officer, commander, officer, and chevalier. The chevalier medal is made of silver, while the others are of gold. The cross is similar to the fleury type, excepting that it has five branches instead of four. This is mounted over a



Cross of the Order of Leopold



Cross of St. George

wreath, and since 1870 has also been surmounted by a wreath instead of a crown.

Russia has two military orders rewarding bravery and service, each of which was instituted by the Empress Catherine II. The Order of St. George has five classes, those of the first and second carrying the rank of major gen-

eral, and the next two, that of colonel. The fifth class was originated by Emperor Alexander I for noncommissioned officers and men. Hereditary nobility is conferred upon the holder of the cross. The Order of St. Vladimir, which was intended to preserve the memory of Grand Duke Vladimir, who opened the way for Christianity in the Muscovite states, also has five classes, while it is



Cross of St. Vladimir

awarded for both military and civil merit. It is the fourth class of the order which is distinctly military, and this may be conferred on the field of battle by a general-in-chief.

The Austrian decoration is the Medal of Valor and Merit, which was created by Emperor Joseph II for subofficers and men. A gold and silver medal, on the back of which are the words, "Der Tapferkeit," meaning "For Bravery," is awarded according to the distinction won by the individual.

Both civil and military honors in Belgium are marked by the Order of Leopold, which was first conferred by Leopold I in 1832. It is separated into five divisions, although in this case the cross increases in size with the rank.

DEVICE THAT CLOSES GATE

8358 VALVES QUICKLY

A new power attachment with which an automobile in the fire-department



With This Device, Run by the Transmission of an Automobile, a Gate Valve Requiring 307 Turns is Opened or Closed in 10 Minutes

service of Boston is equipped, is now regularly used for opening and closing

*The White Company
Cleveland, Ohio*

the valves of the water-supply system of that city. This attachment is a universal wrench socket operated by a worm gear which is run by the regular transmission of the car. The whole device is carried on the running board of the car, and is easily brought into position for use. When it is in position over the stem of the valve, a wrench that fits over the nut is slipped through the socket and the device is ready for use. The utility of the device in case of a fire or a broken pipe is indicated by the fact that some of the principal mains in Boston carry 50,000 gal. of water a minute, and that 307 turns are required for opening or closing a valve in one of these mains. This formerly required the services of four men for about 45 minutes, while this device does the work in 10 minutes. The attachment is a development from one described in the June, 1914, number of this magazine, in which a shaft that turned the valve through bevel gears was attached to one of the rear wheels of the car.

MANY SUBMARINES NEEDED FOR COAST PROTECTION

794 At least 100 more submarine boats are needed for the proper protection of our continental water boundaries, according to a report of the General Board of the Navy Department, of which Admiral George Dewey is the presiding officer. A submarine costs about \$500,000 to build and \$22,500 a year to maintain, while the annual maintenance of a battleship amounts to about \$804,000. The government has appropriated approximately \$265,000,000 for battleships, and \$25,000,000 for submarines in the last 25 years. A policy of constructing submarines in government navy yards has been begun with the "L-8" now building at Portsmouth. *Army & Navy Jour.*

A 30-cent American postage stamp of 1869 was recently sold at New York for \$1,750. The flags on the stamp are inverted, and there are only three specimens of it known to be in existence.

7773 A SPANISH RESIDENCE IN SOUTHERN CALIFORNIA

Cost about \$20,000.



Designed in the Spanish Style, This Residence is Built of Concrete and is Equipped with Modern Facilities

A Striking Feature of the Plan is the Patio, Which is Entirely Inclosed by the Building and is Roofed with Wire Screen



The Clothes Poles, Pergola and Outhouses are All Made of Concrete



A View of the Glass-Roofed Sun Parlor



View of the Living Room, Showing Fireplace Open on All Four Sides

That the Spanish style of architecture is eminently suited to the climatic conditions, mode of living, and traditions of southern California is becoming more evident every day with the increasing number of structures that are being built in this style. One of the latest examples is the residence shown in the illustrations, which is designed in this ancient style, but is equipped in the most modern fashion. This house is built entirely of concrete, and even such accessories as the pergola, clothes poles, and outhouses are of this material. In accordance

with the true Spanish style, the house is built around a patio, or roofless court, which serves as a sort of hallway for connecting the rooms on different sides of the building. At one end of the patio is a glass-roofed sun

parlor. This building contains many novel features, one of which is the fireplace in the living room. This fireplace is open on all sides, permitting persons in the room to sit around it on all four sides, and is so arranged that the hood may be drawn up, after the fire is well started, so that it does not obstruct the view.

WORK OF PREPARING MEALS

7599 LESSENED BY NEW OVEN

An oven which makes it possible for a person to prepare food for dinner early in the day, spend the afternoon

away from the kitchen and return in the evening to find the meal ready to serve, is among the recently invented devices for lightening housework. The cooker is thoroughly insulated so that it retains heat for several hours, and may be used on any kind of a range. If cold food is placed in it, a high flame is

used for a few minutes to heat it and its contents to the right temperature. Without further attention the food will be prepared and ready for serving hot at mealtime. In the bottom of the oven is a damper which, if opened, enables food to be cooked or baked quickly, the same as in an ordinary receptacle.

It has been shown by experiments that round timbers of Engelmann spruce, Douglas fir, tamarack, and the western larch respond readily to preserving treatments. The contrary, however, is the case with firs, hemlocks, redwood, and Sitka in the round.



M. Leo Vignon, Prof. of Industrial & Agricultural Chemistry, Univ. of Lyon, France
MORE EFFICIENT METHOD

8266 FOR MAKING GAS *Lyon (France)*

Reports of the discovery in France of a new process for the manufacture of illuminating gas, which makes it possible to recover approximately 100,000 cu. ft. from a single ton of coal, have reached this country. If it is found possible to employ this method on a commercial scale, it is considered that the importance of the discovery can hardly be overestimated. Gas engineers at the present time obtain between 10,000 and 14,000 cu. ft. from a ton of fuel. Primarily, the new method consists of carbonizing coal in a common retort. Lime is mixed with it and at the completion of the carbonization steam is passed over the coke, which is maintained at a temperature of about 1,500° F. The lime acts as a catalyzer, converting carbon monoxide into methane. The action may be regulated so that water gas is not formed, while the yield of sulphate of ammonia is said to be greatly augmented, since most of the nitrogen in the coal is converted into ammonia. The discovery was made while watching the effect of steam upon carbon in the presence of lime. It was found that three distinct reactions took place, with the formation of hydrogen, methane, and ethylene.

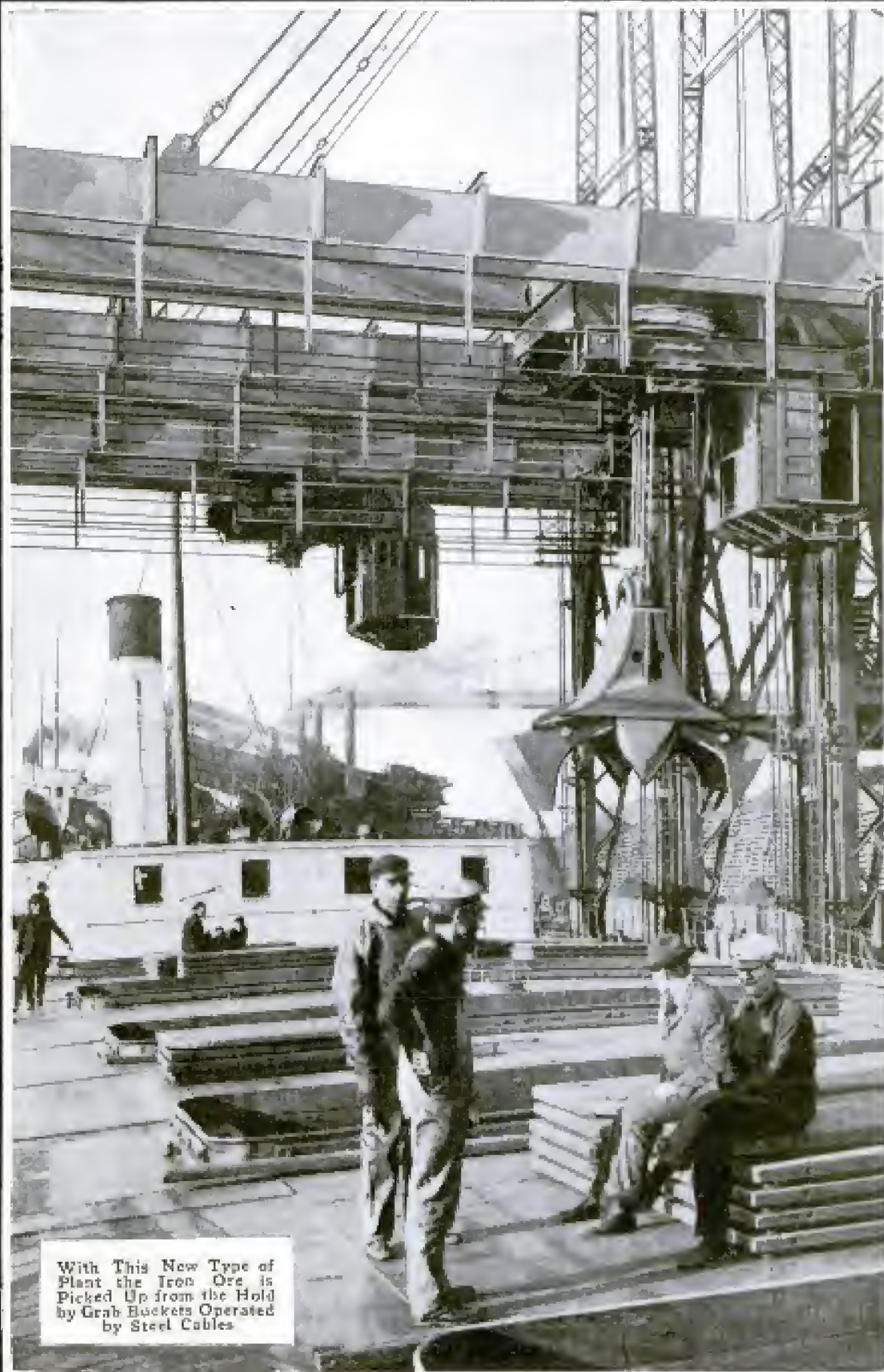
8666 BRITISH AIRMAN IS BURNED TO DEATH IN CLOUDS

While testing a military biplane at Aldershot, England, recently, a member of the British aerial corps was burned to death in mid-air when his machine suddenly became enveloped in flames. A defect in the gasoline tank is thought to have been responsible for the ignition of the gas. The airman was flying at a considerable height when the fire started. He attempted to descend to the earth by gliding, and did so for nearly a mile while the flames lapped about him. The craft then fell to the ground with the pilot, whose body was charred almost beyond recognition.

Chicago Tribune
 11-6-14

7725

NOVEL MECHANISM FOR UNLOADING ORE BOATS



With This New Type of Plant the Iron Ore is Picked Up from the Hold by Grab Buckets Operated by Steel Cables

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**BUFFALO SKULLS ORNAMENT
FEDERAL POST OFFICE**

8363

The post office at Sand Springs, Mont., consists of a small, weather-worn, sod-roofed cabin, not much



Buffalo Skulls Line the Roof of the Government Post Office at Sand Springs, Montana

higher than a tall man's head. This in itself is not especially uncommon, for in sparsely settled territories the distribution stations for mail are frequently far from pretentious buildings. The interesting thing about this particular structure, however, is that the edge of the roof is bordered by a row of white skulls. They are those of buffaloes which, not a great many years ago, roamed the plains in large herds and were as common as horses are today in most of the middle western states. On the Montana ranges, even today, parts of the skeletons of buffaloes may be found.

**STREET IN SAN FRANCISCO
TUNNELED UNDER HILL**

8445

The first of a system of tunnels that are to be constructed under the hills in San Francisco, for furnishing direct connection between the different sections of some of the streets, is the Stockton Street tunnel, now practically completed. This tunnel provides for a driveway, 36 ft. wide, and two sidewalks, each 6½ ft. wide. It is 911 ft. long, has approaches aggregating 412 ft. in length, and is lined with a reinforced-concrete arch.

Engineering Record
6-27-14

The Editor + Publisher
**TAKING MOTION PICTURES
OF THE WAR**

8475

Among the motion pictures of the war that have arrived in New York there are thousands of feet of films that will never be exhibited to the public for the reason that they are too shocking. In getting these pictures, the photographers were compelled to undergo the greatest hardships and dangers, doing their work in most cases in the open, exposed to rifle bullets and shrapnel. In some instances armored cabinets were used for the protection of the photographers, while in others the cameras, fitted with electric batteries and controlled from a distance by electric connections, were mounted in trees. Even with these precautions it was practically impossible to get close-range views of actual fighting.

**HEATER FOR EXPANDING
WAGON TIRES**

8268

When a steel tire is to be placed on a wheel the tire is first expanded by heating so that it will slip over the rim of the wheel easily, and is then



This Heater Uses Kerosene as a Fuel and Heats and Expands the Tire Evenly

suddenly cooled by quenching in water with the result that it shrinks to a tight fit on the wheel. When the tire is heated at a forge, the heating and expansion are usually uneven. A new portable tire heater now being introduced uses kerosene as a fuel, and is capable of being used with tires ranging from 30 in. to 80 in. in diameter.

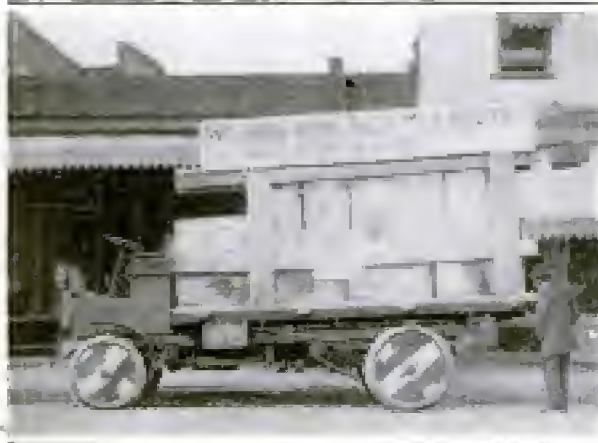
Hauke Mfg. Co.,
140 Livingston St.,
Brooklyn, N.Y.

It consists of a central combustion chamber from which radiate eight outlet pipes for conveying the heat to the tire. Each outlet has a sleeve that makes the heater easily adjustable to tires of different diameters, while the ends of the sleeves are equipped with hoods that confine the heat and distribute it evenly along the tire.

HAUL ICE THROUGH STREETS

8323 AS ADVERTISEMENT

What in many respects is an uncommon method of advertising ice was employed some time ago by a company in one of the Canadian cities. Quantities of fruits, vegetables, and poultry were frozen in standard-sized cakes of ice, loaded on trucks and paraded through the business streets. Each wagon was covered with streamers and



Fruits and Vegetables Frozen in Ice and Displayed in the Streets as an Advertisement

signs, and attracted general attention wherever it stopped. The sight was unusual enough to cause newspaper comment, which served further to advertise the company and its product.

NOVEL PIECE OF MACHINERY USED ON ARKANSAS FARM

To simplify the work of sharpening axes and various other cutting instruments, an Arkansas farmer devised a crude, but ingenious, means of making a horse turn a grindstone for him. By utilizing a couple of old gears found in some discarded cotton-gin machinery, he constructed a circular sweep. The

driving pole is attached to the main gear shaft by the fork of a tree, which serves as a bracing arm. The grind-

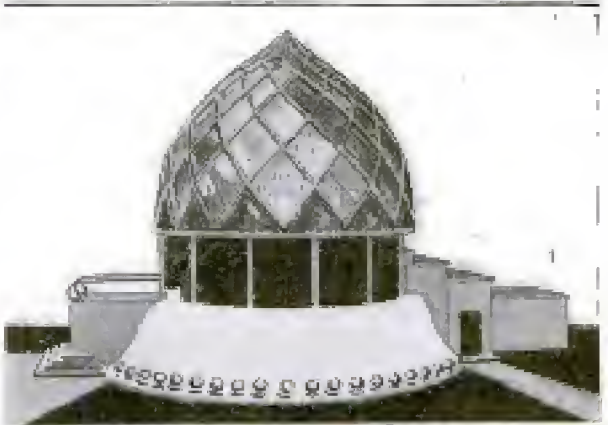


Circular Sweep Connected to a Grindstone by an Arkansas Farmer

stone is mounted at one end of the countershaft which revolves it. When a horse is harnessed to the sweep and is walking at a normal gait, the stone is turned rapidly.

GLASS HOUSE A FEATURE OF LEIPZIG EXPOSITION

A house built entirely of glass was one of the striking features of the industrial exposition held at Leipzig, Germany, in the summer of 1914. The purpose of this curious construction was to demonstrate that glass may be used as a building material, and that since it lets the light through, it can be used in producing architectural and

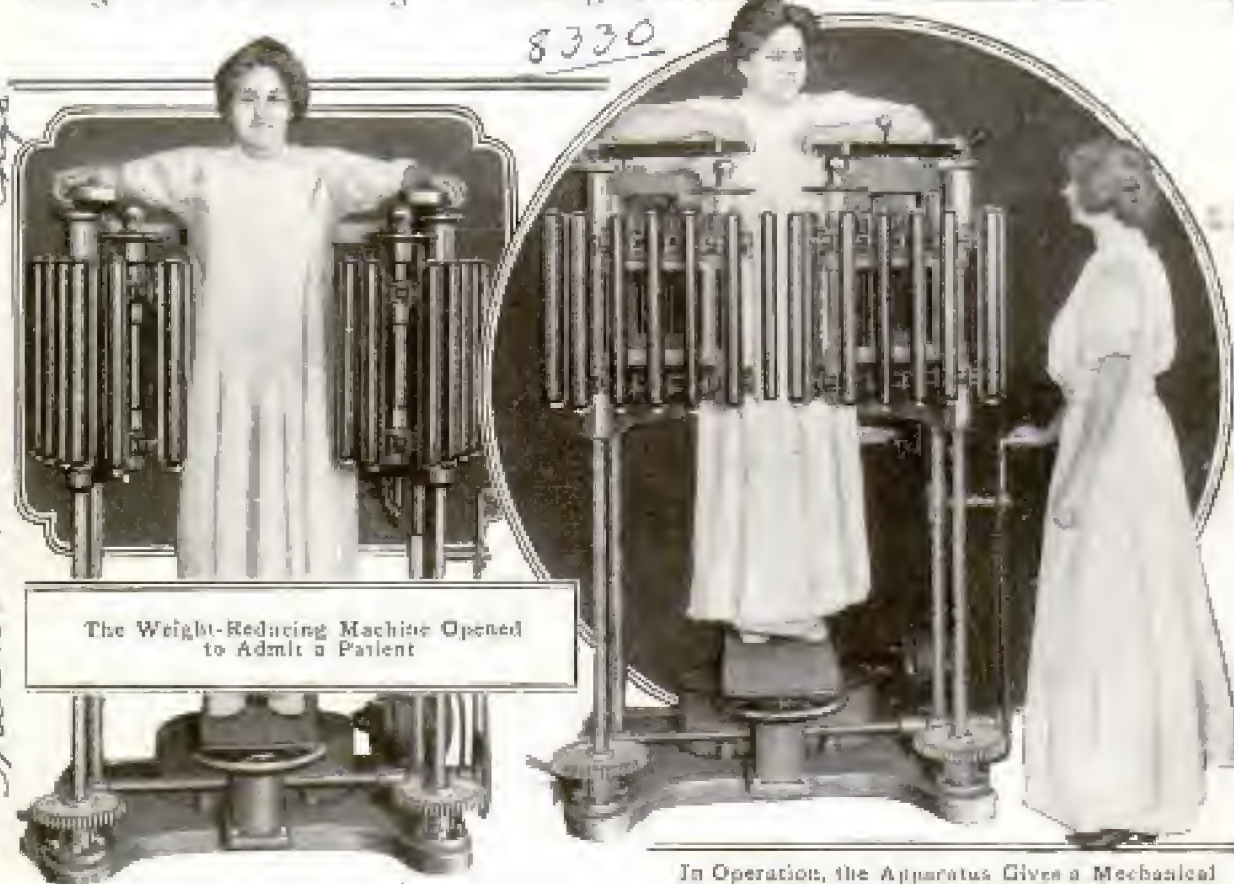


Glass House, Erected to Demonstrate the Possibilities of Glass as a Building Material. Was One of the Striking Features of the Industrial Exposition Held at Leipzig, Germany, in the Summer of 1914

color effects that are impossible with any other material. The walls consisted of glass panels and were made double for insulation against heat and cold, and in the space thus provided the lights for illuminating the building

automatically adjust themselves to the patient's form, revolving in such a manner as to furnish a mechanical massage. Each roller is mounted vertically in a bracket which is attached

Reducing Machine Co.
301 Tower Bldg.
Mich. Av. & Madison St.



The Weight-Reducing Machine Opened to Admit a Patient

In Operation, the Apparatus Gives a Mechanical Massage Which is Intended to Remedy Obesity

were placed. The cupola that surmounted the building consisted of sections of diamond-shaped glass plates, while the interior walls were made of various kinds of glass arranged in patterns. The room under the cupola was about 32 ft. in diameter, and more than 22 ft. high, and in the center of this room was a waterfall illuminated by movable kaleidoscopic lights.

to chains extending horizontally around the two arms of the machine. When a subject takes his place on the standing platform, these arms fold around him, inclosing his body with a belt of rollers. The pressure exerted is variable, being either light or heavy, as is required. Power for the operation of the device is supplied by a $\frac{1}{2}$ -hp. motor through two shafts at the rear, while the opening and closing of the elbows, to allow a person to enter or leave the machine, is done manually.

EXERCISE MINUS EXERTION 8330 GIVEN BY MACHINE

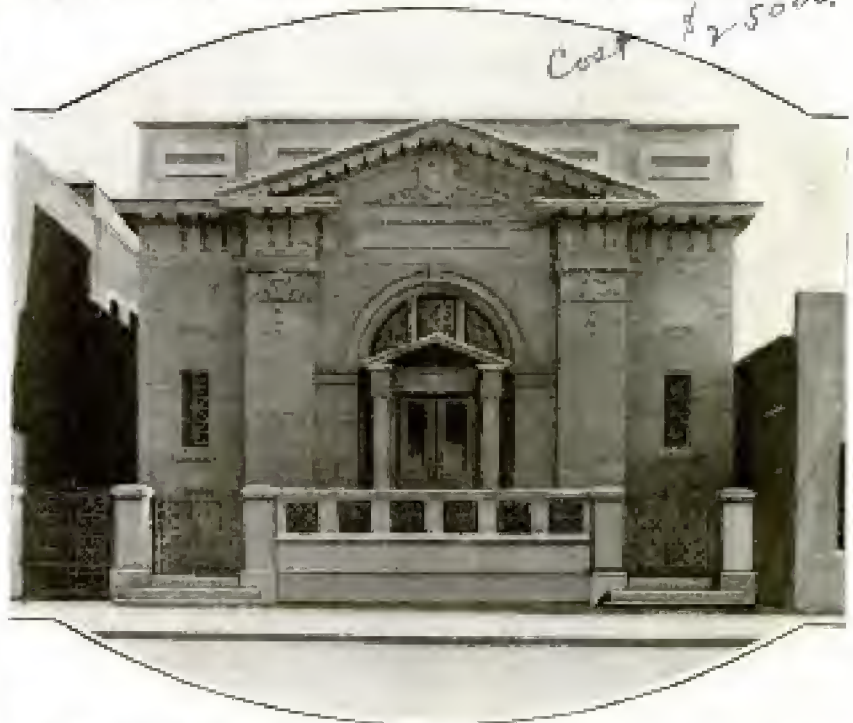
Intended as a means of reducing superfluous flesh and thereby increasing physical efficiency, a machine has lately been developed which provides a method of exercising the body without voluntary exertion. The apparatus is supplied with two roller belts which

Through an accidental opening of valves while a steamer was in the lock chamber, one pair of lock gates on the Welland Canal were carried out, the resulting damage amounting to about \$8,000.

8360 CLUBHOUSE PROVIDES CITY HOME FOR FARMERS

For the convenience of the farmers of the surrounding counties who have contributed to the business growth and prosperity of the town, a clubhouse has been erected at Seymour, Ind., and is being maintained for their exclusive use. Membership in the organization is limited to agriculturists and their families, who make this their residence during their periodical visits from the country. Housekeeping equipment is provided so that meals may be cooked and served by a family in the same manner as if it were at home. There are several small apartments in the building, each fitted with modern conveniences, so that a family may have privacy if it is desired. There are reading rooms and rest rooms, comfortably furnished and well supplied with books

and current literature, and in one part of the building there is a large nursery where a matron is in constant attend-



Clubhouse Erected in an Indiana Town and Donated to the Farmers of Surrounding Counties

ance to care for the children so that the parents may be free to transact their business.



Spearing Fish from the Wharves is Becoming a Popular Pastime at Many of the California Resorts

FISH SPEARING DEVELOPS

8326 INTO WINTER SPORT

Fish spearing is becoming popular as a sport at resorts on the Pacific coast, and it is not uncommon to see its devotees lining the wharves in considerable numbers. A forked harpoon with some forty, or more, feet of strong cord attached to it, is the instrument used most frequently. It is a tense moment when a spoonbill halibut, shovel-nose shark, or mullet is seen easing its way through the clear water. If the man casting the spear is an adept in the art, and the fish is not swimming too deep, the chances are usually against the latter. But it is this element of chance, as well as the demand for skill, that makes the game a real sport.

V. W. Zillick 1521 Oak St., Glendale,

Copyright material

COMBINED ELEVATOR AND 7895 CONVEYOR

An apparatus that not only facilitates the handling of perishable goods aboard ship, or in warehouses, but of-



Combined Elevator and Conveyor at Work
at a Liverpool Dock

fers a decided protection to the goods as they are handled, has been installed at an English dock. This is a combined

elevator and conveyor and is used mainly for loading and unloading ships. The buckets are in the nature of canvas pockets made by attaching the ends of the canvas to the moving supports, the canvas being long enough to form a sag that will hold the goods when one support is above the other as in the operation of elevating or lowering. Each support consists of a rod attached to two endless chains that run on sprocket wheels.

8241 RICH FIND OF JEWELRY IN AN EGYPTIAN TOMB

The discovery recently made by the famous Egyptologist, Prof. Flinders Petrie, of a hoard of jewelry and toilet articles in a burial chamber in the pyramid of Senusert II, one of the earliest Egyptian rulers, is not only one of the most valuable finds of the kind ever made, but establishes a distinctively human link stretching more than 5,000 years into the past. The treasure belonged to an Egyptian princess, and on one of the Canopic alabaster jars is the inscription, "The King's daughter, Sat-Hathor-ant." The princess evidently possessed luxurious tastes and was able to gratify them without stint. One of the objects found is a diadem consisting of a gold band covered with rich inlays and studded with rosettes. Plumes of gold stand up from the back of the crown, and gold streamers hang from its edges. This crown is over a foot and a half high. One pectoral, or breastplate, that evidently belonged to the girlhood of the princess, is of gold inlaid with lazuli and green feldspar. This breastplate is nearly two inches high, is covered with figures characteristic of the time, and is elaborately engraved on the back. A second breastplate of similar design was evidently a gift made during the maturer years of the princess, as shown by the nature of the engravings. Two pairs of gold bracelets, each having sliding gold clasps, are inlaid with minute beads of gold, carnelian, and green feldspar. The toilet articles consist of a silver

The Keystone Sept. 1, 1914

to the lowest possible amount. A wagon with this kind of bearings



This Wagon, with Axle Equipped with Outer Bearing, Carried a Load of 8,000 Pounds with the Center of the Axle Entirely Cut Away

carried a load of 8,000 lb. with the center of the axle entirely cut away.

BIPLANE HELD BEST CRAFT FOR MILITARY PURPOSES

Of the types of aerial craft so far developed, the biplane is the most satisfactory for military purposes, according to the belief of the chief of the army signal corps, who in his annual report to Secretary Garrison recently pointed out the changes wrought in warfare by flying machines and the importance of this country heeding the lessons taught by the European conflict. As for the dirigible, it is maintained that too many favorable conditions seem to be necessary for its successful use to make it especially valuable as a service unit. In order to stimulate American manufacturers in developing and perfecting this form of craft, however, it was recommended that for every 35 aeroplanes purchased by the government, one dirigible be bought for experimental purposes.

Japanese woodcuts are made parallel to the grain on lengthwise pieces of cherry.

WHEELLESS TRACTOR BUILT FOR SOFT GROUND

WITH separate clutches governing each track, eliminating the necessity for front steering wheels, a caterpillar-traction engine is being made for use in rice fields and for heavy hauling over mired or sandy roads. The machine may be turned completely around in a circle ten feet eight inches in diameter.



The Holt Caterpillar Co., Peoria, Ill.

J. L. Kraff, 82 W. South Water St., Chicago



The Burial of an Old Steamer of the Great Lakes

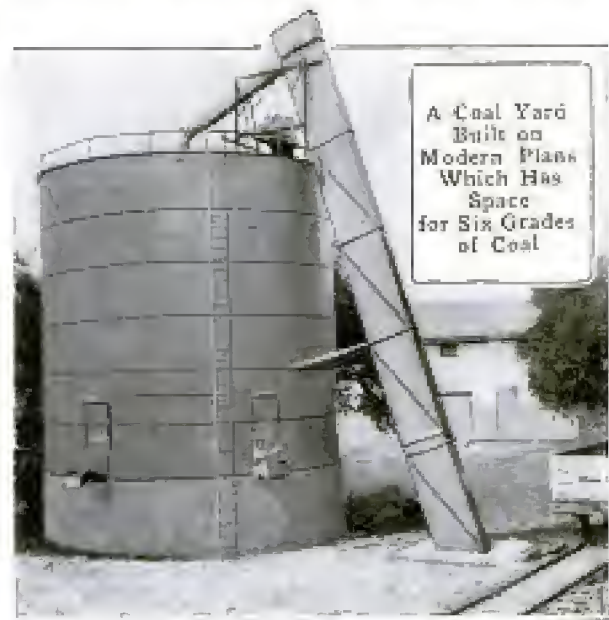
WORN-OUT STEAMER BURNED 8382 IN LAKE MICHIGAN

After nearly a half century of service, an old side-wheel steamer, known as the "Sheboygan," which plied Lake Michigan between Chicago and other west-shore ports, was dismantled and burned. The burial of the vessel followed the discovery by its owners that it was no longer seaworthy, and that its possible future value was not so great as would be the cost of strengthening it. It was towed several miles out into the lake, away from the traffic lanes, soaked with tar and kerosene, and then fired by a torch. The flames from the burning timbers were fanned by a stiff breeze which carried clouds of black smoke along the horizon for miles.

CITY COAL YARD IMPROVED 8164 BY NEW HOUSING METHOD

By the construction of a steel coal bin, which is similar in appearance to the storage tanks employed at grain elevators, a Sodus, N. Y., dealer has done much for lessening the disagreeable features of the average city coal yard. The large container rests on a concrete foundation and is divided into

six separate chambers, each of which is used for a different grade of coal. The greater part of the manual labor ordinarily connected with handling coal is eliminated. A conveying apparatus, operated by an electric motor, carries the coal from the cars, as they arrive on the siding, into the bin desired. In less than an hour the car is unloaded and the coal housed.



Chutes at the base of the tank are arranged so that a wagon may be filled in a few minutes' time.

Alvah H. Silver
Sodus, N. Y.

8692 *See Data - File*
TURNING IN THE SEA TO HELP THE ALLIES

WHEN the Belgians opened the sluice gates and let the sea into the basin of the Yser River to stop the German troops in their desperate attempt to advance along the coast from Ostend to Calais, they placed an obstacle in the way of the invading army that was apparently decisive in turning the issue to the advantage of the allies. This means of defense is not new. It has been used repeatedly by the people of Holland for stopping or destroying an invader, and in one case—that of the siege of Leyden, in 1574—the cutting of the dikes resulted not only in the relief of that city but in the drowning of thousands of the invading Spanish army. Although the reports from the present European war are uncertain and conflicting, there seems little doubt that the flooding of the Yser basin in the early days of November, 1914, was the direct cause of an even greater loss of life than occurred at Leyden.

Just what fighting under these conditions meant, especially to the invading army, is easily understood from the fact that the coast from Ostend to the vicinity of Calais and for miles into the interior is either below the level of low tide or only a few feet above it and that the country is cut up by a network of small rivers and canals. At one point near Furnes, a town that has figured prominently in the war reports, the land is 7 ft. below sea level. These lowlands are protected by a sea dike that extends the full length of the Belgian coast and into France to a point near Calais. The range from low to high tide along this coast is about 20 ft. This range of the tide explains how it was possible for the Germans to take certain positions at low tide and then at the next high tide find themselves in danger of drowning or marooned and practically helpless in the face of the fire from the allies. The fluctuation in the level of the water also made it impracticable to use boats, even if boats had been available, while any advance over land covered with shallow water was extremely dangerous on account

of the many canals and ditches. While the inundation of these lowlands served as a serious check to the Germans, it also made it difficult, if not impossible, for the allies to take advantage of any successes by moving forward against the Germans. Several days after the sluice gates had been opened a dispatch from the scene of the fighting reported that the inundation had made these lowlands almost entirely uninhabitable, that the inundated country was occupied only by the dead, dying and wounded, and that it was impossible for either army to advance across it.

**FESTIVAL ATTIRE IS MADE
 OF KERNELS OF CORN**

8462 A novel carnival costume, which was worn at one of the fall festivals, was patterned after that of the medieval knight, and was made almost entirely of corn. Thousands of kernels were sewed in rows over heavy cloth, giving the attire the general appearance of a coat of mail, which it was intended to represent. The helmet and shield, as well as the boots, leggings, and belt, were covered in a like manner. The lance was made from a piece of cornstalk, fastened to the end of which was a long ear of corn, surrounded by strips of husks.



About \$2,000,000 has been subscribed for a direct line of steamers between Sweden and the United States, to begin service in 1915.

J. P. Hummel, Provincial Treasurer, Toledo, O. D.

8000

NEW OILING DEVICE FOR HOGS

The use of a specially prepared oil which is applied by a device that any hog of ordinary intelligence can operate is said to result in improvement

See Sep-16-408



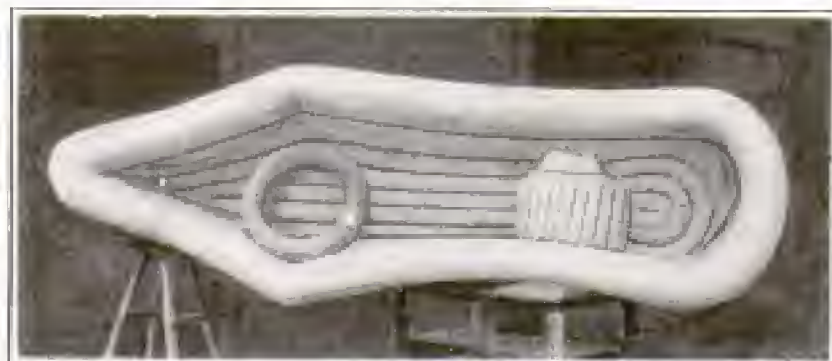
Hogs Taking Their Turn with an Oiling Device Which Tends to Keep Swine in Good Condition.

in health and living conditions among hogs fortunate enough to be supplied with this facility. The device for applying the oil consists of a trough, an oil bottle and an oil roller. The roller is placed horizontally on bearings above the oil-filled trough and at such a height that it will take up a film of oil as it is turned, while the trough is kept supplied by the oil bottle. All the hog has to do is to rub persistently against the roller and to turn it slightly whenever in his opinion the roller needs turning.

SEAWORTHY BOATS MADE OF JAPANESE PAPER

From the Japanese paper known as "hashikirazu," treated chemically to make it waterproof, an ex-admiral of the Japanese navy has succeeded in making paper lifeboats that can be packed away in a space of about one cubic foot, but which, when inflated, are seaworthy and durable. This paper is made from the fiber of the mulberry tree. It is unusually durable and possesses great strength when the stresses are in the direction of the fiber. A thin sheet that is strong when stressed in any direction can be made by pasting two sheets of the paper together so that the fibers cross at right angles, and this is the way in which the paper is prepared for making the paper boats. Although the paper was chemically treated originally only for the purpose of making it waterproof, tests have shown that this treat-

ment makes it fireproof as well. The idea of making paper boats had its origin in the need for some means of saving those caught in accidents to submarines, where, owing to the limited space, it is practically impossible to



This Boat Consists of Inflated Tubes Made of the Japanese Hashikirazu Paper. When Deflated, It can be Folded to Occupy a Space of About One Cubic Foot.

carry any kind of boat unless it can be folded down to small compass. The first boat consisted simply of a big pillow with a depression in the center, the whole being blown up with air. Owing to the ease with which the paper can be punctured it was evident that such a construction would not be safe. The next step was to make several pipelike bags and place them side by side in the

Inventor Rear-Admiral Yokoyama (Japanese Navy)
Hashikirazu (from mulberry tree fibre)

Japanese Magazine
Sept.



The Primitive and the Modern in Transportation Seen in a Canadian City

form of a raft, and this construction was finally modified to the form of a boat. The result is a life-saving craft practically immune to wreck, for even if one or two of the pipes are punctured or broken, the boat still has sufficient buoyancy to be seaworthy. Owing to its strength and lightness, and its waterproof and fireproof qualities, this paper is evidently adapted to a wide range of uses, among which are the making of coverings for aeroplane wings and for dirigible balloons. A curious use to which it is already being put in France is that of making cheap coffins.

GLIMPSE OF FRONTIER DAYS 8350 SEEN IN CITY STREET

Although this is the age of the aeroplane, motor car, and wireless telegraphy, the advent of these speedy mediums of transportation and communication has not eliminated the slow-going primitive vehicles of pioneer days. This is strikingly shown by the accompanying photograph which was taken recently in a Canadian city when a double yoke of oxen drawing a typical prairie schooner brushed elbows with a modern steam locomotive, an electric street car, and a gasoline motor car. The schooner was trekking overland from Oklahoma to the Peace River country in northern Alberta, just as scores of settlers pushed into Kansas and

Nebraska in the early days of the Middle West. Incidentally, the locomotive and the oxen were both headed for the same general district.

INSTRUMENT FOR LOCATING VARIOUS CONSTELLATIONS 8343

An instrument has recently been invented which enables a person unfamiliar with astronomy to locate any of the various constellations. The device is provided with a dial which is divided into two parts, the outer rim being held in a fixed position and the inner arranged so that it may be revolved. Mounted on a perpendicular post in the center of the dial is a pointer capable of being adjusted to different angles. The fixed part of the dial is divided into twelve sections, each one representing a month and being subdivided by lines for each of the days. The inner disk is separated into 24 sections, each numbered for an hour of the day or night and carrying also



from N. McCormick
5424 East 11th Park, Chicago

Francis S. Lister
17-18th St. Hanover, Ill.
Bellamy St.
St. Louis, Mo. Alberta Co.

the names of the constellations in the order of their positions. In locating the position of a star the finder must be placed on a level surface with a certain side facing the north. The dial board must then be tilted to an angle equal to that of the latitude in which the observation is to be made, and the point on the inner dial, indicating the hour of observation, turned to coincide with the line on the outer dial representing the day of the year. A bar extending from the base of the pointer is placed over the name of the constellation which it is wished to find, while the arrow is elevated to the angle indicated in degrees at the right of the name of the constellation. This done, the pointer indicates the constellation.

ICE FOUNTAIN ON BELLE ISLE NEAR DETROIT

An interesting example of peculiar ice formation is to be seen in the accompanying photograph of a frozen fountain on Belle Isle in the Detroit River. The falling water in freezing about the base of the structure formed the general outlines of two figures, a man and a woman, which stand out in relief and may be easily distinguished. The fountain formed a striking winter scene.

In the Winter Months Hundreds of Persons Visit Belle Isle, near Detroit, to See This Fountain Which Frequently Exhibits Curious Specimens of Ice Formation



USE INCANDESCENT LAMPS FOR ENGINE HEADLIGHTS

Incandescent electric lamps are to be substituted on all passenger and freight locomotives of the Southern Pacific Railway for the gas headlights and electric arcs in present use. Although the filament of the new burner is only $\frac{1}{16}$ in. in diameter and consumes no more energy than two 16-cp. lamps, when properly focused, it is capable of developing more than 700,000 cp., and will burn for three months without requiring attention. Until engineers perfect a special generator, upon which they are now working, the current for the lamp will be supplied by storage batteries mounted on the engines. Tests made with the light show that when a train is going at high speed, dark objects 2,000 ft. away are illuminated. The advantage claimed for the incandescent lamp over the arc is that it throws a powerful shaft of light of constant intensity which is always in focus, while the brilliancy of the latter fluctuates and its focus is uncertain because of the imperfect burning of the carbons.

Unstamped letters mailed by British sailors are delivered in England without charge.

*a. n. ... electrical engr.
So. Pac. Co. San Francisco,
superintending installations*

*from the Bulletin issued by Southern Pacific Co.
Bureau of News, Nov. 1, 1914*



The Reinforced-Concrete Arches of a German Cathedral After the Forms were Removed



Interior of the Church Showing the Arches After the Roof had been Built

SLENDER CONCRETE ARCHES

8042 USED IN CATHEDRAL

Long-span reinforced-concrete arches are being used as supports for the roof of a large cathedral now in the course of erection at Offenbach, Germany. While the use of the arch in concrete construction is common in bridge designing and similar work, it takes the form of a vault instead of the slender members employed in bridging the walls of a building. It is for this reason that the engineering in question holds particular interest. While the arches span a distance of approximately 38 ft. and are wide apart, they are not much larger in circumference than fair-sized steel girders, although they naturally are solid instead of being formed like the latter.

MOTOR-CAR CAMPING OUTFIT

8405 CARRIED ON TRAILER

Folding into a compact space for transportation, a camping outfit which has recently been devised for motor tourists is carried on a two-wheeled trailer designed to be attached to the rear of a car. The sides of the vehicle are hinged so that when they are dropped down they form an extension for the tent flooring, which is held far enough above the ground to keep it dry during disagreeable weather. A

complete light-housekeeping equipment is carried in the body of the trailer, while at the rear there is a compartment which provides space for a small lavatory. Sheets of celluloid are used in the window frames instead of glass, lessening the danger of break-



This Camping Outfit, Designed for Motorists, may be Folded, Ready for Transportation, in a Few Minutes

age during transit. The tent may be erected for occupancy, or folded up for transportation, in a few minutes.

Tests conducted by the leading railways of France are said to have shown that fogs may be dispelled by means of electric waves. A radiating apparatus embodying the principles of wireless is used, and it is claimed that in certain instances the atmosphere has been cleared for distances of 600 ft. in front of the antenna.

G. L. Edholm

1353 West 36th Place

Los Angeles, Cal.

Geo. A. Walton
3 Lenny's Court,

108 Newbury, POPULAR MECHANICS

SAFETY-FIRST FEATURES 8253 OF BOSTON SUBWAY

To safeguard against the contingency of accidents in boarding the subway cars, a strip of carborundum



nearly two feet in width has been placed near the edge of the concrete platforms at the various stations of a recently completed Boston tube. This greatly reduces the danger of a person falling, regardless of the condition of the flooring, when the weather is disagree-

able outside. Provision is made in the Boston subways system for the accommodation of surface cars, and since there are steps to these there would be the same danger of accidents in loading and unloading passengers, as is characteristic of nearly all traction cars, were provisions not made for safety. By sloping the platforms somewhat, this difficulty has been overcome to a degree. The steps are placed in comfortable reach so that a woman wearing a tight skirt is not in danger of tripping when attempting to board a car.

OHIO CITY HAS SMOKELESS 8548 RESIDENTIAL DISTRICT

In a new residential addition in Toledo, Ohio, no gas or coal is used for any purpose, the lighting, cooking, and cleaning being done by electricity, and the houses heated by hot water supplied from a central heating plant. Experience with the houses already ten-

anted shows that the housewife soon learns to use the electric current economically, and that the electric home can be operated almost as cheaply as one in which coal and gas are used. The kitchens in these houses are small, 8 by 10 ft., are finished in white enamel, and are supplied with every modern convenience. The stoves used have boiling, baking, and grill compartments, and are equipped with alarm-clock time switches for placing the heaters in operation and for regulating the heat.

SELF-OILED TROLLEY WHEEL 8090 FOR STREET CARS

Furnished with conical bearings for the reduction of friction, a self-lubricating trolley wheel, recently patented, is designed to eliminate much of the noise typical of those commonly in use. The two centers, or axle points extending from the fork on either side of the wheel, are tapered similarly to lathe centers and pivot in concave surfaces bored in the two ends of the shaft. Each of them is drilled hollow and has a small orifice in the



point. The chamber thus provided becomes an oil cup which, by a wick that passes through the aperture, lubricates the contact surface. Sufficient oil to keep the wheel running smoothly for a week is contained in the hollow chamber.

A compressed-air cleaner designed to remove dust and insect eggs from furs has a nozzle with a $\frac{1}{4}$ -in. opening.

POISONOUS PLANTS OF

85-4 TROPICAL JUNGLES

Plants that secrete poison when touched, and inflict a wound almost as dangerous as a rattlesnake bite, are one of the features of some tropical jungles. The most common of these poison plants is the *Jatropha urens*, known in Panama and other parts of Central America as the "ortiga brava," (the cruel nettle). This plant is easily recognized and is instinctively shunned by the native animals. Trunk, leaves, flowers, and fruit of the plant are covered with stinging hairs, which are in effect long tubes that are very brittle and break at the slightest touch. The poison is produced by a cell, which, during growth, swells up, forming a goblet-shaped bulb set into the surrounding tissue. When the hair is touched it breaks in an oblique direction, forming a cannula which enters the skin, and the poison is discharged directly into the wound, the action being much like that of the poison fang of a snake. The sting of this plant is painful in the extreme but seldom fatal. Many other tropical plants have such deadly stinging hairs that the poison is sufficient to kill a man, even in small doses.

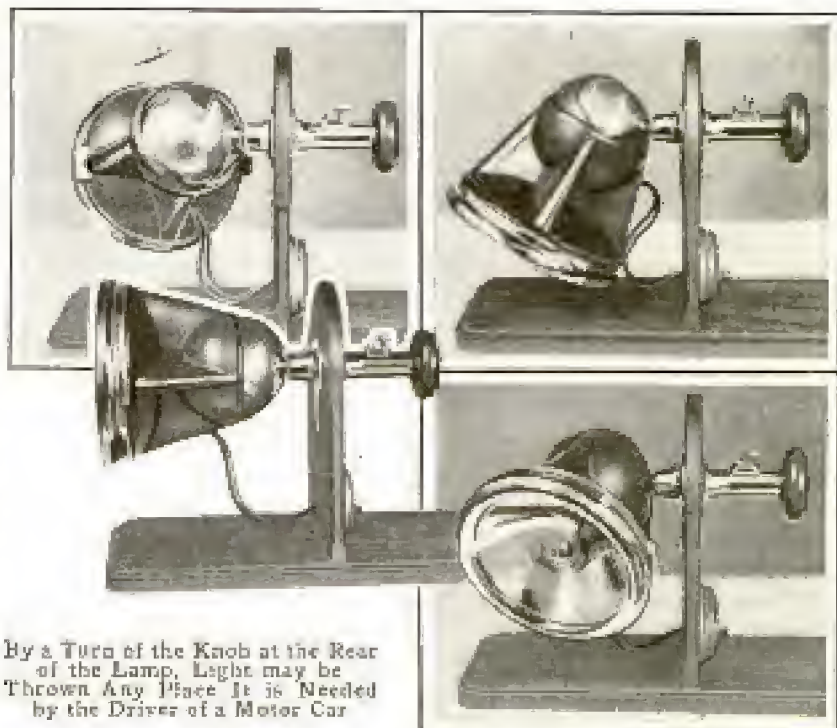
ALASKAN BOUNDARY SURVEY

8615 FINISHED

The work of surveying and marking the boundary between Alaska and the Yukon Territory, which was begun in 1904, has been finished. This line stretches approximately 1,000 miles over mountain ranges and torrential rivers, and was one of the biggest and most difficult jobs of surveying ever undertaken.

FLEXIBLE SIDE LAMP BUILT FOR MOTOR-CAR USE

Adjustable motor-car lights, intended primarily as side lamps, which by a slight turn of a handle may be



By a Turn of the Knob at the Rear of the Lamp, Light may be Thrown Any Place It is Needed by the Driver of a Motor Car

rotated to throw their beams in any direction, have been lately patented. Because of the ease of their operation and the variety of angles at which they may be used, they offer a wide range of service. They are supplied with a ball-and-socket mounting and a universal-joint connection, while a cam plate over the ball, engaging with the horizontal shaft, converts the regular rotary motion to an irregular one, turning the lamp down, sidewise, or straight ahead by a slight turn of the wrist. If the lamp is mounted beside the driver, for instance, by turning the knob on the shaft at the back of the light, the rays may be thrown over the engine, on the tool kit, at a wheel where there is tire trouble, to the right or left of the road, or straight ahead. The device may also be used on a motorcycle or boat.

CA shipment of 6,000,000 horseshoes was recently sent from Pittsburgh to the French and Russian governments.

GUARDING AND DEVELOPING NATIONAL FORESTS

8324

By ROY BOOTHE

THAT part of the timbered area of this country which is included in the national forest reserve, is patrolled and watched over by rangers in the service of the Federal government. It has been the work accomplished by these men in establishing a means of fire prevention and control, that has had much to do in bringing them to public notice in recent years. It is not only the conservation, however, but also the development of these domains, with which the ranger is charged.

Much of his life is spent out of doors in comparative solitude, building trails, roads, and bridges, and doing other pioneer work. Through some of the mountainous portions of California, for instance, hundreds of miles of telephone lines have either been constructed directly by or under the supervision of these men. The attention which is given to the trees covering the thousands of acres of territory in the national preserves, is one of the important functions performed by the rangers, and a thing that few, perhaps, appreciate. A constant lookout is kept for bark beetles and other damaging insects which, if left undisturbed, might in a short time do irreparable injury to a forest. Trees which should be removed are marked for cutting, while those which are needed for seed and shade purposes, or for the protection of a watershed, are preserved. All of this requires somewhat of an understanding of the habits of the various trees and the conditions necessary for their thrift.

Much of the live stock raised in the West today is grazed on lands coming within the forest reservations. It is the ranger who superintends this pasturing and sees to it that the ranges are neither over nor undergrazed. In order to safeguard against either of these conditions, familiarity with the forage value of grasses and shrubs, as well as an ability to estimate their probable abundance, is required. Most

of the national forests are divided into districts, some of which comprise as much as 500,000 acres. Supervision over this territory is placed in the hands of a chief ranger who directs the work done by his scores of assistants, and takes charge of the business transacted. A large part of the revenue accruing from the lands comes from the sale of timber, and from charges for privileges, such as grazing and the use of ground for resorts and summer homes. When trees are cut by a purchaser the timber is scaled by the rangers, and each log recorded by number and volume. After it is removed the inflammable litter is burned, during a period when the woods are wet or under snow, as a precautionary measure against fires. For the most part the rangers are comfortably housed in cabins built by themselves some place in the hills.

POWERFUL SUBMARINE FOR UNITED STATES NAVY

8659 A submarine that will exceed in size and fighting strength any submarine now in service in any navy in the world is to be built for the United States Navy from funds recently appropriated by Congress. This vessel is one of a class of powerful submarines to be known as "fleet submarines." It will have a length of 300 ft., a displacement of 1,200 tons and a steaming radius of 3,500 miles at about 24 miles an hour, so that it will be able to accompany the battleship fleet on any voyage and to engage in offensive fighting on the high seas. It will be equipped with high-power wireless and with rapid-fire guns for self-defense, and will carry enough torpedoes to sink a fleet of dreadnoughts. This vessel is estimated to cost about \$1,250,000.

CA large flour-milling company is urging merchants to accept flour in cotton sacks instead of jute bags, to stimulate a demand for cotton cloth.

Chicago Tribune
11-6-14



Burning the
Underbrush to
Prevent Forest
Fires



Scaling Each
Log and Record-
ing Its Number
and Volume



Road Building and the Construction of Bridges Are Other Duties of the Forest Ranger

Hal G. Hall
485 West Fifth St.
Sonoma, Calif.

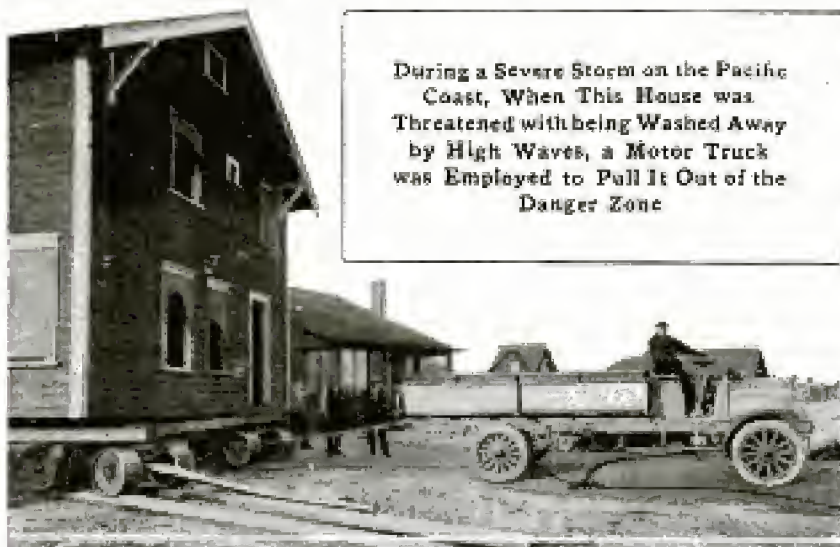
112

POPULAR MECHANICS

MOTOR TRUCK DRAWS HOUSE FROM DANGER ZONE

7489

While many uses have been found for motor trucks, it is not customary to see them employed for the transporta-



During a Severe Storm on the Pacific Coast, When This House was Threatened with being Washed Away by High Waves, a Motor Truck was Employed to Pull It Out of the Danger Zone

tion of buildings out of danger zones when storms threaten property destruction. Yet this very function was performed a short time ago by a machine on the Pacific coast. During high tides a residence near one of the beaches was unexpectedly exposed to the danger of being washed away. In the emergency a heavy motor truck was secured, rollers were placed beneath the house, and the structure was quickly hauled to a position out of immediate danger. The truck did its work by a direct pull.

VALUABLE OIL IS PRODUCED FROM GRAPE SEEDS

8647

Through experiments which have been conducted at an Argentine refinery, an oil, which is especially valuable for the manufacture of soaps, has been produced from grape seeds. The discoverer of the process is at the present time carrying out further tests in Mendoza at the request of the local government. In case it is found that the oil can be produced on a commercial scale at a cost not prohibitive, it is believed that it will have an important effect on the wine industry. In the past grape seeds have been a loss.

Chemical Engineer, Oct. 1914

ARCS ARE BEING REPLACED BY INCANDESCENT LAMPS

8237

High-candlepower metal-filament lamps are gradually replacing arcs for outside lighting purposes in several different localities. Notable among these is an example offered abroad, where the system was installed some time ago for the illumination of a large freight yard and terminal. In places where loading is done there are a number of iron poles carrying in each case a 300-cp. lamp, while for the general illumination of the tracks 50-cp. globes are used. The lamps may be lowered by a

winch and cable, so that it is a simple matter to replace those which have burned out. Sets of hand lamps connected by flexible cables are employed when light is needed for work inside cars.

EYELESS NEEDLE EASILY THREADED

8251

Even a man should find no difficulty in threading a new eyeless needle that has just been patented. This needle is made in two parts, one of which, carrying the point, terminates at the back in a split shank provided with screw threads, and the other, a threaded sleeve, is screwed in place over this shank. Along the line of the split the shank has a groove. In using, the thread is passed through the sleeve and placed in the groove. Then, when the sleeve is screwed into place, the compression of the two sides of the split shank against the thread holds it securely.



Inventor: P. R. Minahan

Fond du Lac, Wis.

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Invented by Alexander Winton & Harold B. Anderson
Cleveland, O. assignors to Winton Motor Carriage Co.

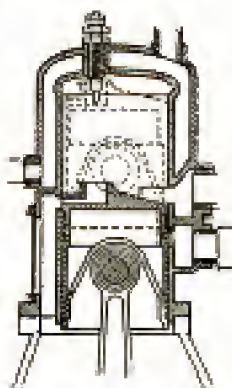
Cleveland, O.

ADAPTING THE TWO-CYCLE ENGINE TO AUTOMOBILES

8133

In an attempt to take advantage of the theoretical superiority of the two-cycle gas engine over the four-cycle engine, one of the largest automobile manufacturers in the country has taken out patents for improvements that apparently overcome the disadvantages heretofore connected with the use of two-cycle engines on automobiles. A four-cycle engine makes four strokes of the piston or two revolutions of the flywheel for each explosion, while the two-cycle engine makes two strokes of the piston or one revolution of the flywheel. In a four-cycle engine, the return stroke of the piston, after it has been forced out by the explosion of the gas, empties or "scavenges" the cylinder of the burned gases, which are forced out through the exhaust port. As the piston goes out again it draws in a fresh supply of gas. On the next inward stroke it compresses the gas, and as it reaches the end of the stroke the gas is ignited and the piston is again forced out by the explosion of the gas. The principal disadvantage in this type of engine is in the valves and in the cam shafts, and other apparatus, required for opening and closing them at just the right times. The two-cycle engine is valveless, the ports being opened and closed by the piston. In this type of engine the gas first enters the crank case, being drawn in by the piston as it moves toward the opposite end of the cylinder. This movement of the piston also compresses the gas already in the cylinder and at the end of the stroke the gas is ignited. Near the end of the return stroke the piston uncovers the exhaust port as well as the entry port at the end of a by-pass connecting with the crank case. The gas in the crank case, which has been compressed by the return stroke of the piston, then rushes into the cylinder, filling it with a fresh charge and scavenging it of the burned gases. A baffle plate on the piston prevents the fresh charge from streaming across to the exhaust port and diverts it toward the

end of the cylinder, where the spark plug is located. In spite of this there is sure to be some mixing of the fresh charge with the burned gases. The ob-



The Piston of This Two-Cycle Engine is So Designed That It Operates Efficiently with a Small or Heavy Charge, Making the Engine Suitable for Driving an Automobile

jection to the two-cycle engine as heretofore made, for driving an automobile, is that it requires a heavy charge to work efficiently, and cannot be successfully throttled down in the same fashion as a four-cycle engine.

The purpose of the new invention is to equip the piston so that it can be used efficiently with small as well as heavy charges. The special feature is a pocket, cast on the piston, which receives a small portion of the fresh charge and carries it direct to the spark plug. In addition to this there is the usual space and baffle for receiving and controlling a heavy charge, so that rapid operation with the throttle wide open is not interfered with in any way. What the cup does is to receive a small portion of the fresh charge and prevent it from mixing with the burned gases during the brief interval required for bringing it in contact with the spark plug.

POCKET REGISTER KEEPS TRACK OF EXPENSES

For the convenience of persons who like to keep an account of their daily expenditures without bothering with a pencil and notebook, a pocket cash register has been invented and placed on the market in France. This register has three wheels which work together after the manner of an adding machine. The right-hand wheel is for

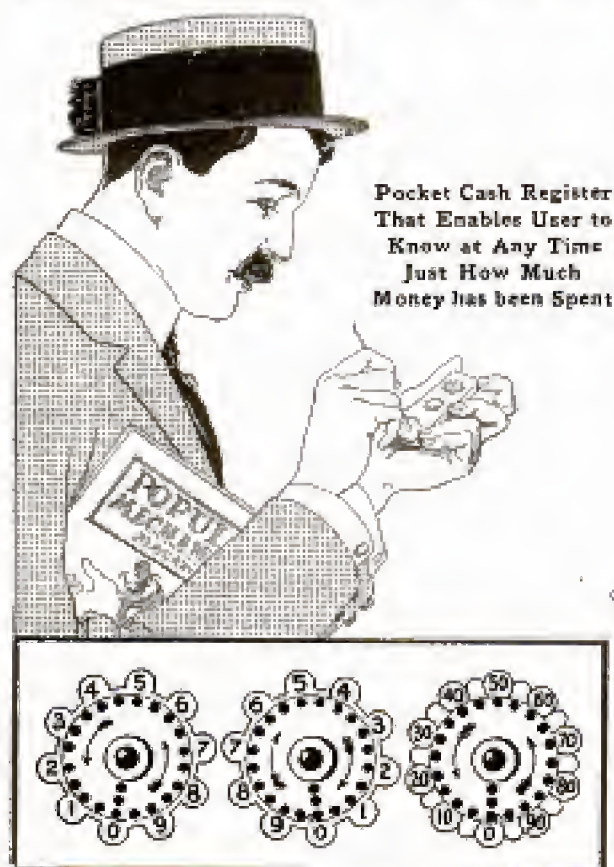
Sold by M. E. Mathieu

1905, rue de la Paix, Paris

Copyrighted material

1046,359 - Dec. 3, 1912 Filed Apr. 2 - '08
Serial #24817

centimes, and after this wheel has made one revolution it turns the middle wheel one space, registering a franc, and after this wheel in turn has



Pocket Cash Register
That Enables User to
Know at Any Time
Just How Much
Money has been Spent

COURTESY OF ILLUSTRATION

made one revolution, it turns the wheel at the left one space, registering 10 francs. The machine will register a total of 100 francs. It can be adapted as well to record cents, dimes, and dollars. It is worked by means of a stylus. The total amount registered is given by figures that may be read through a glass at the back of the case.

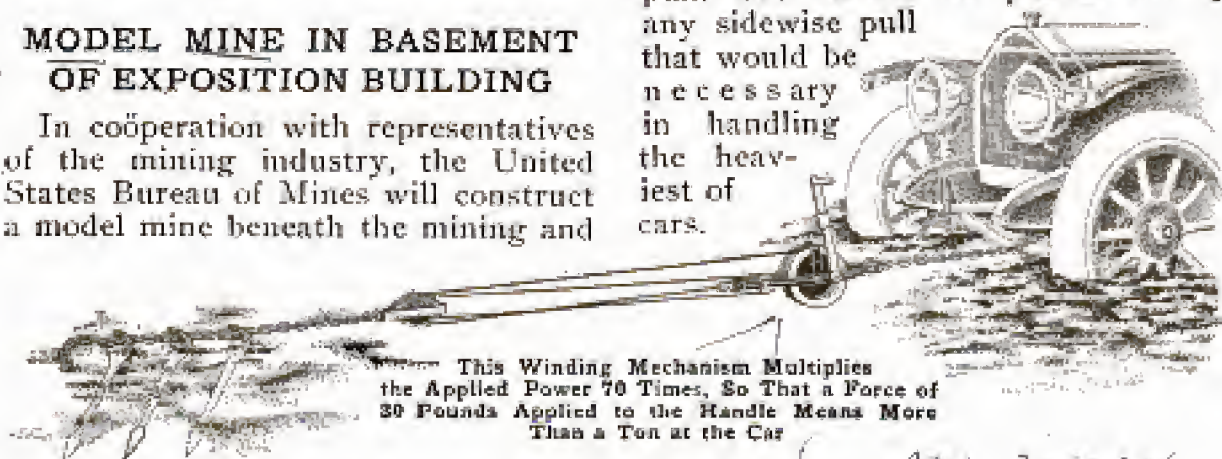
MODEL MINE IN BASEMENT OF EXPOSITION BUILDING

In coöperation with representatives of the mining industry, the United States Bureau of Mines will construct a model mine beneath the mining and

metallurgy building at the Panama-Pacific Exposition. One of the interesting features of this will be the descent into the subterranean passages. Visitors will be given portable lamps and lowered in a cage which will seem to drop many feet while in reality going merely from one floor to the next. This impression will be caused by the strata lining of the shaft, which will pass in a panorama so rapidly as to create the illusion of distance. Underground mining operations, fires, rescue work, and various other phases of the industry, will be shown. Motion pictures are to be employed in illustrating things which cannot be otherwise exhibited.

WINDING DRUM FOR PULLING MOTOR CAR OUT OF HOLE

By means of a compact device that can be stored away in the car, the driver of an automobile or motor truck can easily pull his car out of a hole or bring it back to an upright position when tipped. This device consists of a substantial winding drum, 6 in. in diameter and weighing 13½ lb., and is equipped with 30 ft. of ¼-in. steel tiller rope, capable of withstanding a strain of a ton or more. The gearing in the winding drum is such as to multiply the applied force 70 times, so that a force of 30 lb. applied at the handle means more than a ton at the car. The anchorage consists of three steel stakes that are easily driven into the ground and as easily removed by a vertical pull, but cannot be pulled out by any sidewise pull that would be necessary in handling the heaviest of cars.



This Winding Mechanism Multiplies
the Applied Power 70 Times, So That a Force of
30 Pounds Applied to the Handle Means More
Than a Ton at the Car

Machinery, October 1914

Nov 13-704
July 15-107
Aug 16-134
Adm. Dec 16-124
Dec 1916-901

Miss Rebecca M. Donohue (Inventor) Oakland, Cal.

POPULAR MECHANICS

115

Chicago Tribune Feb. 25, 1913
TO CONNECT DENMARK AND

1064302 June 10, 1913
NEW ENVELOPE MAY BE

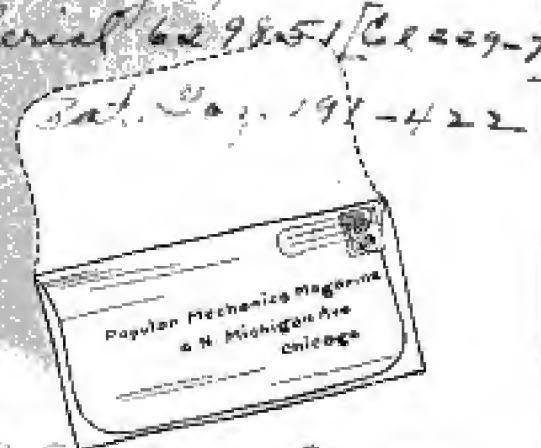
6725 SWEDEN BY TUNNEL

REUSED FOR RETURN

Plans are being made by the governments of Denmark and Sweden for a tunnel under the narrow channel that separates these countries. Although this is not nearly as big a job as the proposed tunnel under the English Channel, it will be like it in one respect, as the stratum through which it will be driven is the same kind of impervious gray chalk that underlies the English Channel. The greatest depth below the sea will be about 100 ft. It is estimated that the tunnel will cost about \$25,000,000, and that it will require five years to complete it.

A young woman of Oakland, Cal., recently patented a novel return reply envelope which is simple in the ex-

-filed May 27, 1911



New Envelope can be Used Twice

#5. B. Irving, Santa Monica, Cal. treme, looking like any other envelope except that at the top there is a dark blue line along which it is to be opened. Upon cutting this line and removing the inclosure, it is found that the back of the envelope, instead of being cut off, has an extension flap, which is addressed to the sender. This flap carries a gummed edge, and may be folded down over the original address, and pasted into place, thus again sealing the letter, which is now ready for the stamp and the mail box. Another feature of the new envelope is that it can be sent unsealed with security. By doubling over the extension flap and locking it in the letter, the inclosure is held firmly, while the envelope remains open for inspection.

FOUNTAIN PEN FOR DRAFTSMEN

The process of filling the ruling pen takes a considerable portion of a draftsman's time, for the lines upon his drawing must be clear and distinct. A recent invention permits a saving by making the ruling pen self-filling, and by reason of a hollow holder gives the draftsman a fountain pen. The pen is removable, and equipped with a feed tube and a rubber gasket by means of which ink may be forced into the holder with the breath. After filling, the pen is replaced and may be used all day without again re-filling.



CA new rail, which weighs 120 lb. to the yard, is being given a trial by the Pennsylvania Railway.

ACCIDENTS DUE TO POOR LIGHTING

That fully 25 per cent of the accidents to workmen are caused by insufficient lighting for men working at night, is the opinion of experts who have made a study of the subject. It is estimated that \$250,000,000 is the average annual cost of injuries to workmen in the United States alone, and that over 50 per cent of these accidents are preventable.

The Illuminating Eng. London, Sept.

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Contrib. & Editor:
J. F. ...
302 ...

The ...

NOVEL AND PRACTICAL THINGS FOR DAILY USE

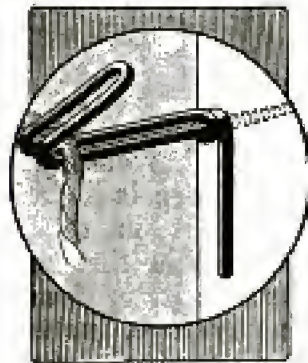


Detachable Enameled Tray
for High Chair

easily cleaned is being made for children. All corners in which dirt might collect are eliminated. When the need for the tray is outgrown by a child,

FITTED with a white-enameled steel tray which may be detached and washed the same as a plate, a high chair that is the device may be removed and the chair used without it.

A fastening device for a clothesline which prevents sagging, does not require the tying of knots and allows quick detachment, has recently been introduced.



Convenient Fastener for
Rope Clotheslines

The contrivance consists of a strong wire hook, which when screwed into a post or wall, provides a spring grip for a rope. The weight of clothes on a line is not sufficient to cause a cord to slip through the device, but a quick, backward jerk will remove it instantly.

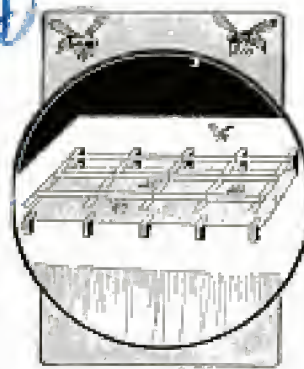


Knife Corer and Quarterer
Apples

An apple corer and quarterer which does its work in one operation, saving time and minimizing waste, consists of a four-bladed knife. The instrument is placed on the top of the fruit and pressed down, dividing it into four sections and cutting out the core. The device is particularly useful when large quanti-

ties of apples are being prepared for canning.

Fly-paper holders which are intended to prevent lace curtains, table linen,



A Guard for Sticky Fly
Paper

and similar things, from being soiled by accidentally coming in contact with the sticky surface, are being made. They are in the form of metal guards that extend protecting arms over the top of the paper, gripping its edges so that there is no chance for them to curl, or the sheet to be blown about a room by an unexpected gust of wind.



Push Pin Which Penetrates
Wall at an Angle

The familiar "push pin" for hanging small articles, light pictures, etc., on walls without marring paper or plaster has been improved by constructing it so that it penetrates the wall at an angle, thus providing a firmer anchorage and making the whole more secure. This new type of pin has a metal head so that it may be hammered without breaking.

Intended to meet the objections common to many teakettles, one which has its lid at the side instead of the top, and so



New Type of Teakettle

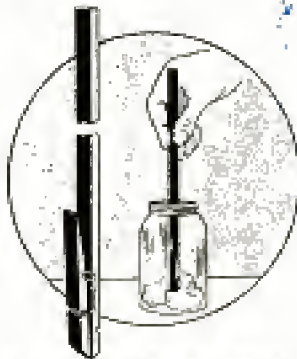
mounted that it swings toward the bail, protecting the hand from being burned by steam, has been introduced. The handle is stationary, which prevents it from becoming heated and also eliminates the danger of the kettle tipping while water is being poured from it. A plunger on the left side of the bail opens the lid, which is hinged in place.

For moistening the atmosphere of a furnace-heated room, a water pan, which fits into the hot-air-pipe beneath a floor register, is being made. In the center of this is an inverted-funnel wall which permits the air currents to pass up from beneath without obstruction. By occasionally pouring a small quantity of water in this pan the atmosphere of a room may be kept moist and healthful.

To simplify the work of cleaning narrow-necked bottles, vases, and similar articles, a



Air Moistener for Furnace-Heated Rooms



Convenient Bottle-Washing Device

long, slender clip handle has been devised for holding dish cloths. A clamp at one end of the stick grips a cloth tightly and makes it easy to reach into places too small to admit the hand.

A combination kitchen table and

A Table and Ironing Board Combined

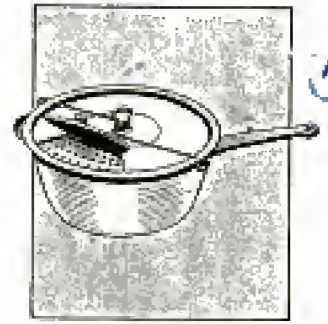
ironing board which is being manufactured, solves the question of what

to do with the latter member when it is not in use. By lifting the table top the ironing board is raised up so that it may be folded into position. When it is not being used it is contained in the table and consequently is entirely out of the way.

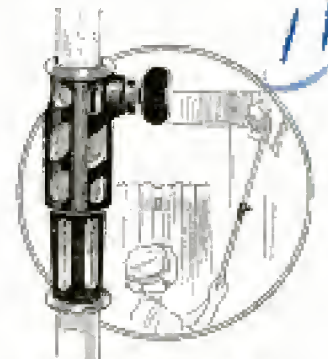
Patent rights have been asked on a cover for cooking utensils which locks in place and furnishes a strainer through which boiling water may be drained. The purpose of the device is to prevent the scalding of the hands or the loss of food by the accidental slipping of the cover.

An extension handle for a broom is intended for use in sweeping the walls or ceiling of a room. The device consists of a stick, at the end of which is a metal socket provided with a thumb screw. The end of the broom handle is inserted in this and fastened securely in place.

Carrying all the utensils and food necessary for serving a meal to six persons, a combination lunch cabinet and table has been devised for the use of motor tourists. When folded, the box is practically dust-proof and approximately 24 by 15 by 6 in. in size. It is arranged to fit into plates screwed in the floor of the tonneau back of the front seat.



Strainer Cover for Cooking Utensils



Extension Handle for Brooms



Motor-Car Lunch Cabinet

COIN-CARRYING BAG THAT SORTS THE COINS

A coin-carrying bag that automatically sorts the coins according to their diameters and is designed for the



A Novel Coin-Carrying Bag That Automatically Sorts the Coins According to Their Diameters

convenience of street-car conductors and others who are constantly required to make change has recently been patented. The bag consists of two pockets, one placed behind the other. The bottom of the rear pocket projects under the front pocket, while the front pocket has a sievelike bottom with openings of such size that the smaller coins drop through into the rear pocket and the larger coins are held in the front pocket. The idea of the invention is that the coins as received are to be dropped indiscriminately into the front pocket, but that when change is to be made, it will only be necessary to reach into one of the pockets, where coins of only the required denomination will be found. By arranging a succession of pockets the automatic sorting of more than two kinds of coins may easily be arranged for.

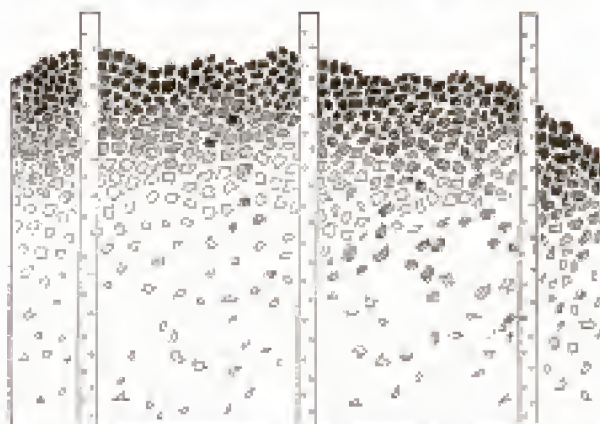
ELECTRIC TOWBOAT-PULLED BY SUBMERGED CABLES

A novel electric towboat has been built and placed in service for hauling barges through the Harecastle tunnel on the North Staffordshire canal in England. The water in this tunnel is too shallow to permit the use of propellers, while the roof is so low that

it barely clears the tops of the barges operating on the canal. The method heretofore in use for propelling the barges through the tunnel was that of "legging," a process in which the members of the crew lie flat on their backs and work the barge along by pushing with their feet against the roof and sides of the tunnel. The new towboat pulls itself through the tunnel by steel ropes laid on the bottom, which pass through the bottom of the boat and around electrically driven grooved wheels. Power for driving the wheels is supplied by a special barge carrying 150 cells, and capable of discharging sufficient current to meet the demands of several trips. There are two of these barges, and while one barge is at work, the cells of the other are being charged at a charging plant. With the towboat 17 barges, each carrying 20 tons, can be taken through the tunnel in about 40 minutes, while a barge formerly took from two to four hours to go through.

PREVENTING SPONTANEOUS COMBUSTION OF COAL

A simple way of preventing spontaneous combustion is in use by an Ohio company that often has occasion to store coal in piles containing several hundred tons. At 12-ft. intervals over the area where the coal is to be stored are placed square vertical vent pipes made of 10-in. boards which are perforated with 1-in. holes placed 6 in.



Ventilating Ducts Prevent Spontaneous Combustion of Coal by Carrying Off Heat and Gases Formed in the Interior of the Pile

These
apart. These are of such height as to stand well above the coal pile, and serve as flues for carrying off the heat and gases formed in the interior of the pile. This arrangement has proved sufficient for run-of-mine coal, but where slack is being stored it is considered good policy to install horizontal perforated vents leading to the vertical shafts.

NOVEL THREADER CREEPS THROUGH CONDUIT

In putting wires underground there arises the problem of threading the conduits, a task which has taxed the ingenuity of telephone, telegraph and electrical engineers for years. Ferrets have been trained to run through the conduits, carrying silken cords from tiny collars, by which larger cords and ropes were later drawn; pneumatic devices have been tested, and now a



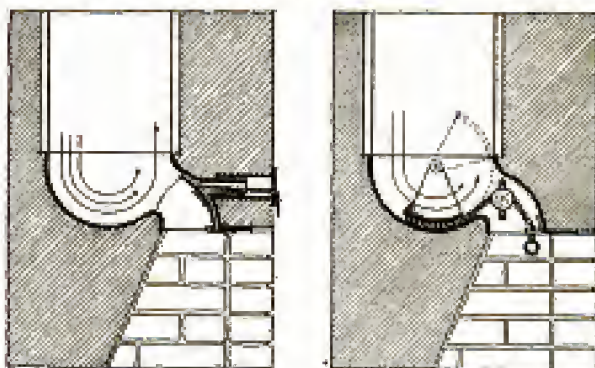
Mechanical Threader for Underground Conduits

patent has been issued for a mechanical threader which creeps through the conduit at a rate of 60 ft. a minute. The device consists of an arrangement of springs, levers and grips mounted on a central shaft in such a way that successive pulls or jerks on the trailing rope forces alternate portions of the contrivance ahead, each gripping the interior surface of the conduit until released by the next jerk.

VITAL PARTS OF FIREPLACE BUILT FOR INSTALLATION

While to all appearances the construction of a fireplace is a simple thing, to build one which will operate satisfactorily under all conditions requires skill and experience. It is often difficult for a builder to procure the services of men thoroughly versed in this character of work, which in the end frequently means faulty designing. To insure correct construction, an apparatus which embodies the vital parts of a fireplace and provides for proper

air circulation and control, has been introduced. It combines a gathering chamber, down-draft check, throat, and

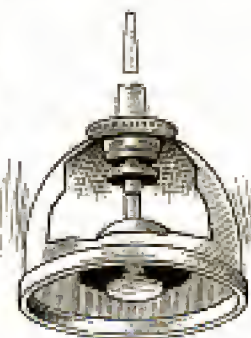


This Device is Intended to Assure the Proper Construction of Fireplaces Even When the Work is Being Done by Inexperienced Labor

draft-control damper. When a fireplace is being erected, this appliance may be built in to connect the grate opening with the flue, thus assuring an intelligent arrangement of the different members. A draft plate is fitted in the down-draft check, which is at the bottom of the gathering chamber, and is operated by a chain from one side of the outer wall.

NEW SQUIRT CAN THAT PUMPS OIL ON PRESSURE

An improvement in oiling devices is a squirt can which has a movable button on the bottom. When this button is pressed the oil is forced out of the spout under pressure. Ordinary oil-cans with flexible bottoms work all right when the spout is clean, but if the spout is stopped, one cannot tell whether the can delivers oil or not when poked into an oil hole, because the bottom yields anyway. The new device is in effect a pump, the piston of which is worked by the button on the bottom of the can, and if the spout is stopped up, the button will not push in, or else, if enough pressure is applied, the obstruction will be forced out.



Specialty Device Co.

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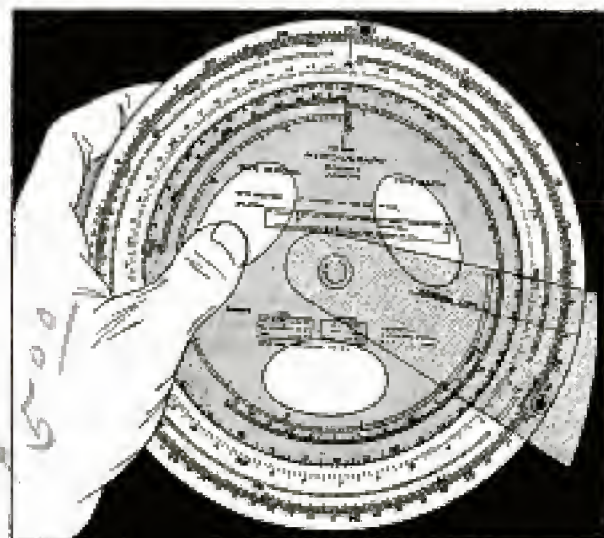
*Specialty Device Co.,
Cincinnati, Ohio*

*1742 Monmouth St.,
Cincinnati, Ohio*

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SLIDE RULE FOR FINDING TRUE NORTH

Engineers and surveyors often find it necessary to lay out a meridian, as a true north and south line is called.



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Slide Rule for Finding a True North and South Line from Observation on the Sun

This is usually done either by taking a "sight" on the polestar or by using a "solar attachment" fixed to the telescope of an engineer's transit. A true meridian may be established by an observation on the sun, without the use of special appliances, but this involves a long and complicated mathematical process. A circular slide rule is now being introduced which performs this computation mechanically and in such a way as to require no mathematical skill on the part of the user. This instrument consists of two rotating disks pivoted together at their common center and protected by a transparent covering. Over the covering is a transparent reading arm which is also pivoted at the center of the disks. Each disk carries a number of finely divided scales, and the computation is made by settings and readings of these disks in combination with the reading arm. All that is needed is the latitude of the place and the altitude and declination of the sun. The latitude is taken from a map. The altitude of the sun, or its angular distance above the horizon, is found by measurement with a surveying instrument

or by calculation from the shadow cast by an upright stick. The declination, which is the term used for the angular distance of the sun north or south of the equator, is taken from a handbook. These are used in making three successive settings of the instrument, the final result of which is the "bearing" of the sun, or its angular distance east or west of the meridian. From this a true north and south line is easily laid out.

New York World Sept. 20, 1914

FEDERAL AGENTS EXAMINE

NATION'S OYSTER BEDS

All commercial oyster beds along the Atlantic coast will be subjected to a comprehensive investigation this winter by government bacteriologists. When completed, the survey map will show every known polluted field, thus enabling agents of the Bureau of Chemistry to examine shipments coming from suspicious grounds. The work has previously been completed in Chesapeake Bay, so that the conditions in that region are already fully known.

CAUTION

On page 281 of the August issue of Popular Mechanics Magazine a decarbonizer was described and one of our readers, in attempting to make gas with such a generator, caused an explosion by excessive heat and an unclean tube.

While this generator will work with safety, if properly constructed, it is liable to burst if not built exactly as described and the gas generated with the heater made for it. The chemicals for use in such a generator must be pure. It is also absolutely necessary that the chemicals be kept clean, and that no sulphur or any form of organic matter, such as sugar, wood, sawdust, grease, etc., be allowed to become mixed with the chlorate, as it will then become a violent explosive. The heat must not be intense, and a very little alcohol on the wick of asbestos will be sufficient to burn in making the gas.



Fire Caused by an Unclean Automobile Sod Pan

Some automobile fires are caused by neglect to clean the machine carefully. In one instance, what might have been a disastrous fire was caused by not keeping the sod pan clean. While cranking the motor, a backfire ignited the oil in the sod pan, and great damage was avoided only by the quick action of the garage owners. It was apparent that the owner had not cleaned the sod pan for several months, and the accumulation was so great that it easily produced a large flame. It is well to clean out the oil dripping frequently.

Small Crane for a Wagon

Occasionally heavy objects must be lifted into a wagon bed, which calls for two or more men to do the work. Not always having sufficient help at hand, one farmer made a light crane that can be readily attached to a wagon, which aids him in hoisting all loads too heavy for one man to lift.

The crane consists of a 2 or 3-in. gas pipe, about 12 ft. long, and two brackets, also a block and tackle. One of the brackets, A, is forged to fit over the rear axle of the wagon and provided with a vertical bearing on which to set the end of the pipe. The other bracket, B, is shaped to form a ring around the pipe, and is attached to the wagon bed in front of the standard. The pipe has about 2 ft. of one end bent over, as shown, which is drilled to receive a ring that can be used to fasten the tackle. A double tackle will be sufficient for all purposes.

The pipe can be easily taken out when not in use. The bend in the pipe will allow the object being hoisted to

clear the rear end of the wagon box, whereupon the crane can be swung



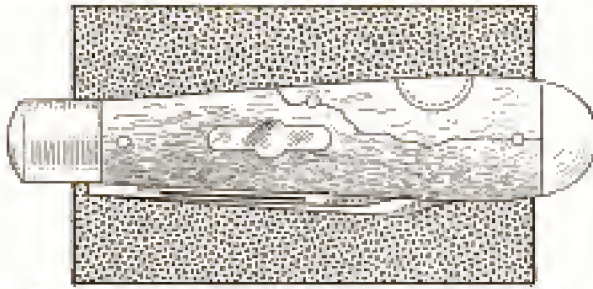
Wagon Crane Made of a Length of Gas Pipe
with a Block and Tackle Attached

around and the object lowered.—Contributed by C. E. Carmack, Louisville, Ky.

Repairing a Broken Stag Handle on a Knife

The staghorn on my pocketknife split, allowing a part, for about one-half the length of the handle, to slip away from the rivets. I quickly repaired it by filing a groove in the broken part of the horn, as shown in the sketch, and slightly beveling the edge as in countersinking a hole. The

broken piece was replaced and pressed firmly under the rivet heads. After cleaning the brass lining of the handle

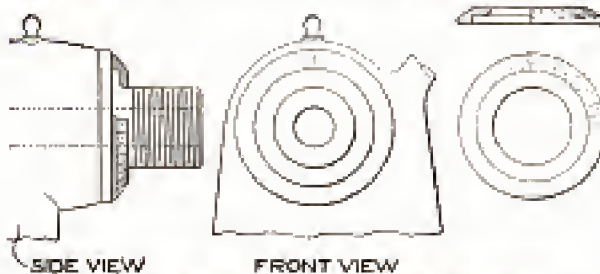


A Piece of Solder, Fastened to the Metal of the Knife, Holds the Broken-Off Horn in Place

and applying flux, I filled the groove full of solder, then dressed it down to the proper shape. In a longer break two or more grooves could be used with success.—Contributed by C. E. Stewart, Jr., Edgeworth, Pa.

Protractor Attached to Lathe Spindle

Considerable time and labor can be saved and greater accuracy assured, by using a graduated ring as protractor attached to the lathe spindle, for laying out work held on the lathe. The ring should be sufficiently large so it may be counterbored to fit the spindle shoulder, which projects out slightly from the headstock housing. The front end of the housing, being faced off, affords a good surface over which the ring may revolve. Center lines, at exact right angles with each other through the spindle center, should be marked on the end of the housing, for obtaining settings with the protractor. The face of the ring opposite the counterbore is beveled



Graduated Ring on a Lathe Spindle Used as a Protractor for Laying Out Work

off, to provide a larger space for the protractor divisions.

In graduating the ring for degrees and fractions of a degree, the utmost

care must be taken, since the value of the instrument as an accurate protractor will depend mainly on the correctness of the divisions. If a regular protractor is available which closely corresponds in size to the outside diameter of the ring, the necessary divisions can be transferred direct. In case no suitable instrument can be had, a preliminary graduation should first be made on a piece of paper. For this purpose a circle may be drawn, as large as the compass will permit. Without changing the setting, the compass will step around the circle exactly six times. If these divisions are further divided into six parts, each part will equal 10 deg. It is not necessary to subdivide more than one of the 10-deg. divisions into degrees and half degrees. A smaller circle may then be drawn from the same center used for the divided circle, but corresponding in size to the outside diameter of the ring. Radial division lines may be drawn across the smaller circle, by using a straightedge as a guide, placed over the center and in line with the successive divisions of the large circle. The ring should then be placed over the smaller circle—pasted on, if preferred, to fasten it more securely—and the divisions transferred carefully all around. To form the finer divisions, the ring may be shifted 10 deg. each time, and the marks on the paper carefully transferred as before. The completed protractor can then be fastened to the spindle with pins or countersunk screws. No harm will result from the faceplate or chuck fitting up against the ring, as this takes the place of the spindle shoulder.—Contributed by D. H. Moss, Washington, D. C.

To Aid the Cooling of an Automobile Engine

The overheating of an automobile engine can sometimes be remedied by changing the pitch of the fan blades, so that an increased amount of air will be thrown against the radiator. A little twist to the blades will help considerably in keeping the engine cool.

Assembling Piston Rings Properly

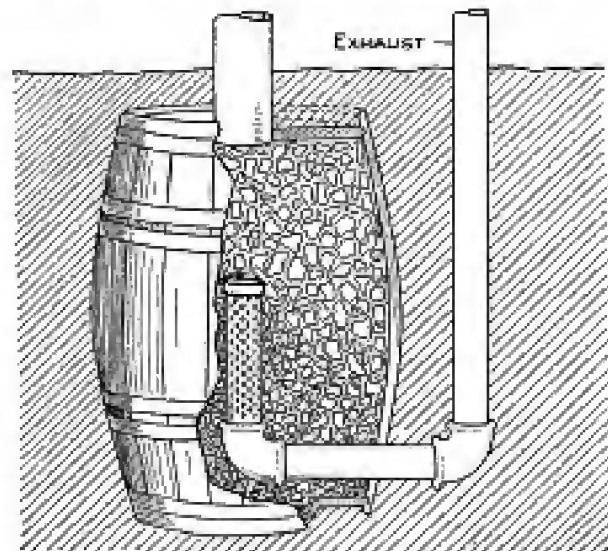
Faulty compression on a gasoline engine is due in many cases to the lining up of the piston rings; that is, all slots are located so that they are in line with the length of the piston. This forms a path for the gas to escape. Trouble of this nature can be easily avoided if care is taken when the engine is overhauled and reassembled. The slots of the rings should be staggered, and in addition, the right and left slots should be alternated. Then, even if the slots should happen to line up, the path of the escaping gas is broken up more or less, and very little compression is lost.

Thawing Pipes by Electricity

The gasworks in a city used a 2-in. pipe line, run under a street, to carry oil from car tanks on a railroad. During a cold snap, water from condensation was frozen at the lowest point in the pipe under the street. To take up the pavement and dig down to the pipe in the frozen soil would have been an expensive job. An electrician was consulted, and by way of an experiment, electricity was tried out with success to thaw out the frozen part. Two transformers were placed in a line wagon and connected together so as to reduce the voltage and increase the amperage. The wagon was located at a pole on the street and connection made to the overhead wires, using the pipe under the ground as a part of the

Muffler for a Stationary Gas Engine

Where it is desired to muffle the noise of an exhaust to a minimum, use a barrel set in the earth and filled with

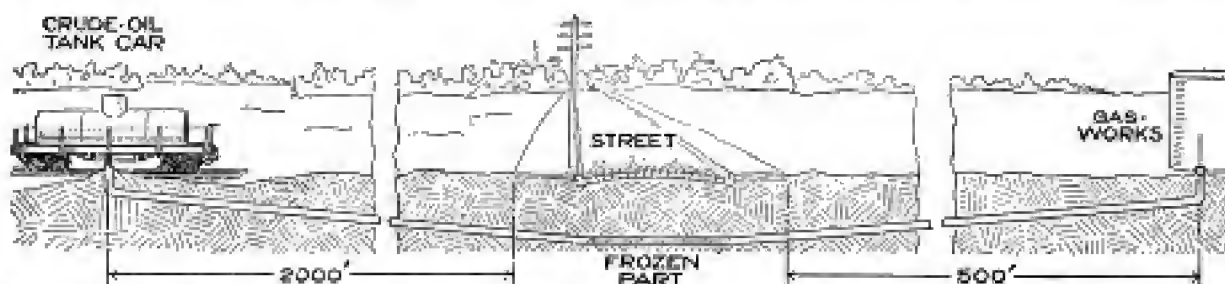


A Barrel Filled with Cobblestones and Set in the Earth to Make a Muffler

small stones about the size of cobblestones. Dig a hole and set the barrel—an oil or sugar barrel—below the surface, then run the exhaust into it from the bottom. A short piece of pipe at the end is capped and the body drilled full of small holes. A large opening should be provided at the top for the discharge of the burnt gases.

Shaping a Log Canoe

To give a permanent form to a log canoe, such as described in a recent issue of this magazine, follow out the method described herewith. When the



Heating a Long Underground Pipe Line with Electricity to Melt Out Ice Frozen at the Lowest Point under a Street Where It Was Impossible to Get At without Considerable Expense

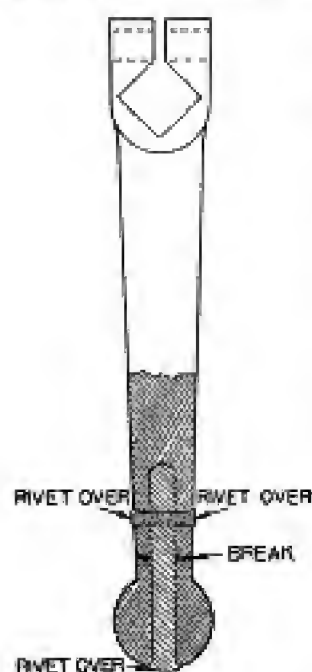
line. About 600 amperes were used to sufficiently heat the pipe to melt the ice. It took four minutes to remove the ice and start the flow of oil.

canoe is finished, block it up properly and fill it with water. Build a good fire to one side, and place a collection of small boulders in the coals.

When the stones are well heated, place them in the water. This will quickly raise it to a boiling heat. In a few hours, the wood will be thoroughly softened. Then sticks are placed at proper intervals to bend the sides out to the proper curve given to gunwales. The water and stones are then removed, and the canoe is left to dry. This will give the canoe a good shape which it will retain without blocks of any kind.—Contributed by H. L. Whited, Ashland, Ore.

Repair for Automobile Steering Lever

A quick, yet efficient, road repair of a broken steering lever on an automobile can be made



as shown in the illustration. The lever broke near the ball end. The parts were put together and drilled for a suitable size rod. This was pressed into the pin end of the lever, and a hole drilled through both, after which a rivet was driven in place, uniting the two. The ball end of the lever was then pressed over the projecting rod, which was then securely peened into a countersunk hole in the ball, completing the repair.

Hard and Soft Lathe Centers

Lathe centers for metal working are made of tool steel and finished hard or soft according to the work. For the tailstock, the center is hardened after turning it up to the proper taper, and finished smooth. It is drawn to a light-brown color on the point. There is never need for a soft center for the tailstock.

For the headstock, both hard and soft centers are advisable. When a lathe has a hollow spindle, and rods are run through the hole, the center is frequently removed and replaced. Even though the center and its hole are kept clean, a replaced center rarely runs perfectly true on the point. When a job requires accuracy, this center must be turned up true each time it is set in the headstock spindle; consequently the life of such centers are very short.

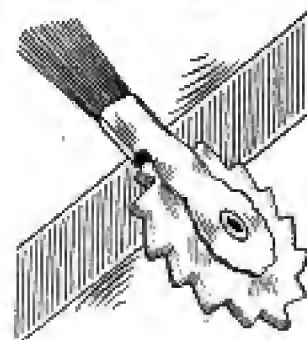
If a lathe-center grinder is available, the center can be made hard and ground true instead of turning it. It is economy to keep a hard center for the headstock and use it on jobs that do not require great accuracy.

Marking Fluid for Stenciling

Procure a light, neutral spindle oil and some lampblack in oil. Add enough of the black paste to the oil to produce a black ink, allowing the oil to be as thin as water. Use sparingly, as a very little goes a long way. This makes a good impression, as it is absorbed into the wood and no pigment will remain on the surface to smut; it dries satisfactorily, and does not gum up the brush and pot. It can be used in a fountain brush.—Contributed by E. P. Schafer, Cleveland, O.

Notches in a Typewriter Eraser

The circular typewriter eraser will prove more efficient if teeth are cut in its circumference, as shown in the sketch. The common type of an eraser becomes hard with use and will make a blotch when erasing words on a carbon print. The teeth have a tendency to clean themselves, consequently make a neater erasure.

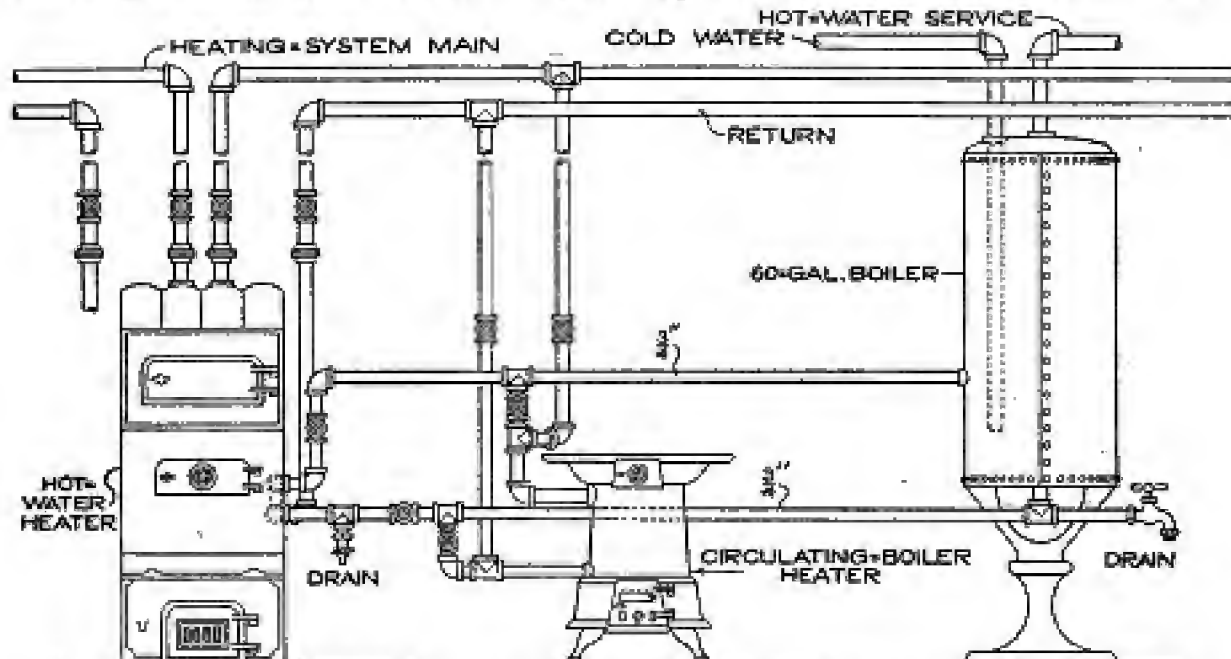


Boiler and Heater Connections for a Range Boiler

By J. J. O'CONNER

As a gas stove took the place of a coal range, we had no way to heat the water in the range boiler, therefore a small tank heater was installed for the

the tank-heater system could be changed from the range boiler to the heating system, or vice versa, by turning valves. The small heater is suffi-



Hot-Water Heating System and Its Connections with a Small Tank Heater and Range-Boiler Heating System So That the Tank Heater can be Used in Mild Winter Weather to Remove the Chill from the Rooms

purpose, which was used during the summer, and in winter the water was heated with a coil made of 1-in. pipe and placed in the fire box of the boiler for the heating system. In making the connections I thought of a way to connect the pipes from the tank heater to the range boiler with the trunk lines of the heating system so that the tank heater could be used to take the chill from the rooms in the early fall and late spring.

The connections were so made that

cient in mild winter weather and is a great saving of coal. Another good feature is that the large boiler heats up the system too hot for mild weather and the little tank heater keeps the rooms in a moderate temperature for such weather. The illustration shows the connections. Care must be taken always to close the valves that are open before opening other valves. This precaution will prevent the overflow of the expansion tank from the pressure of the water main.

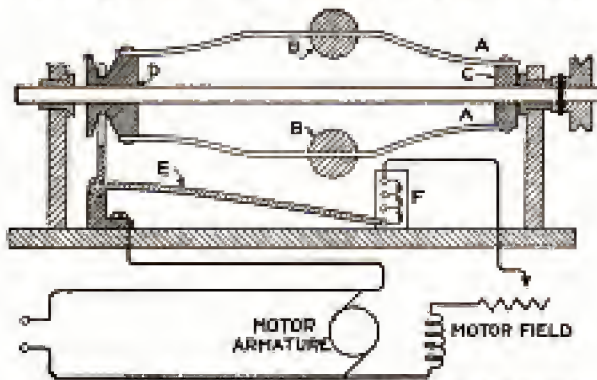
A Speed and Voltage Regulator for a Dynamo

The speed of a shunt motor decreases if the voltage of the circuit to which it is connected decreases, or if the load it is operating increases. If the strength of the magnetic field of the motor be weakened a proper amount, when there is a decrease of speed due to either of the above causes, the speed may be restored to the original value and the

operation will continue until there is another change in load or supply voltage.

A somewhat similar condition exists in the operation of a generator; that is, if the speed of the machine increases, there will be an increase in the generated voltage, and there will be a decrease in the available voltage at the

terminals, if the load increases. With an increase in the speed of the machine the strength of the magnetic field must be weakened in order that the voltage



An Ordinary Governor in Type Which Operates a Connection over Resistance Contacts in the Motor-Field Line

may remain constant, and with an increase in load, the magnetic field must be strengthened in order to maintain a constant terminal voltage.

Some of these conditions may be greatly reduced and in some cases almost entirely eliminated by the use of a simple device similar to the one shown in the illustration. Briefly, the device is nothing more nor less than a centrifugal governor, the operation of which controls the position of a movable contact on a resistance. The device may be either belt or direct-connected to the machine with which it is to operate.

The flat steel springs A carry weights B, fastened at their center. The right ends of the springs are attached to a small disk, C, which in turn is fastened rigidly to the shaft of the device, while the left ends are fastened to the disk D, which is free to move along the shaft, as the weights move out or in, due to a change in their speed. A lever, E, has a U-shaped end that fits in a groove in the disk D, and its other end moves along the resistance F as the disk is caused to move along the shaft. The weights are thrown outward and all the resistance in F is in the circuit. The connection to the resistance F may be changed from the upper to the lower terminal, in which case the resistance will all be out of the circuit when the weights are thrown out.

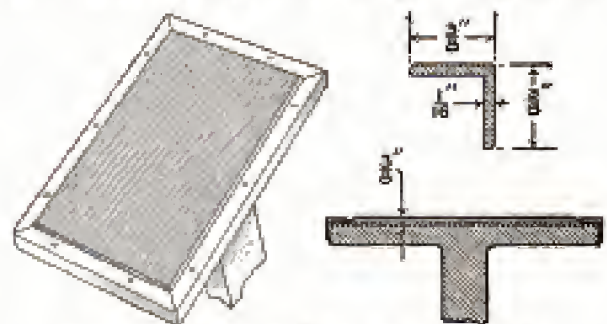
The operation of the device in controlling the voltage of a generator is as follows: If the speed of the generator is decreased, the field must be strengthened in order to raise the voltage, and this means that there must be a decrease in field resistance as the speed goes down, or the connection should be made to the upper end of the resistance F. The value of the resistance in the different sections of F will depend on the required change in field current.

In the case of a motor, the connection to the resistance F should be made at the bottom, so that the field current will be decreased with a decrease in speed, and as a result the motor tends to speed up, due to the weakening of the field. The speed, of course, will not be restored to its original value, as the operation of the device depends upon there being a change in speed, but the speed will be nearer constant with the device in circuit than it is without it.

An Automobile Pedal Pad

A handy device to incorporate on the pedal of an automobile is a rubber covering for the ordinary pedal pad, which is especially useful in the winter when the shoe soles are more or less covered with snow, which makes them slip off the pad.

The rubber covering shown is made of ordinary rubber matting, $\frac{3}{8}$ in. thick, and fastened to the pedal pad by means



Rubber Pad Held in Place on the Face of a Pedal with Brass Molding

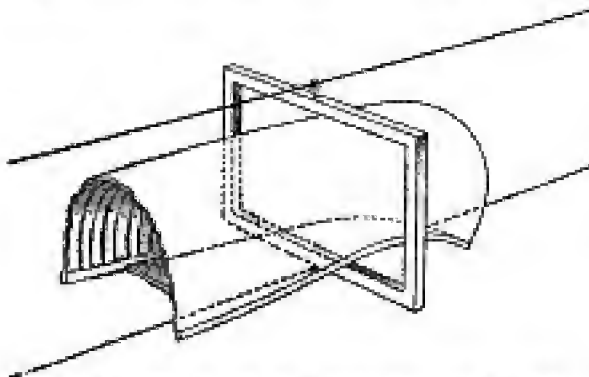
of some angle brass molding, held in position with small brass screws. When polished, the pad will present a very neat appearance.

Making a Perfect Register in Printing Circulars

In printing the forms for circulars or booklets that have borders or cuts alike on both sides, such as a rule border in color to be printed the same on all pages, use the following method to get a perfect register. Be sure to have a smooth, hard tympan, and after the job is made ready, make alternate impressions on the tympan. The offset will be as good as the original print.—Contributed by M. F. Labrum, Los Angeles, Cal.

Suspended Frame for Transferring Canoe into Locker or Boathouse

Difficulty is frequently experienced in transferring a canoe from the water to the canoe locker or boathouse, but by means of the arrangement shown, the operation can be done quicker and eas-



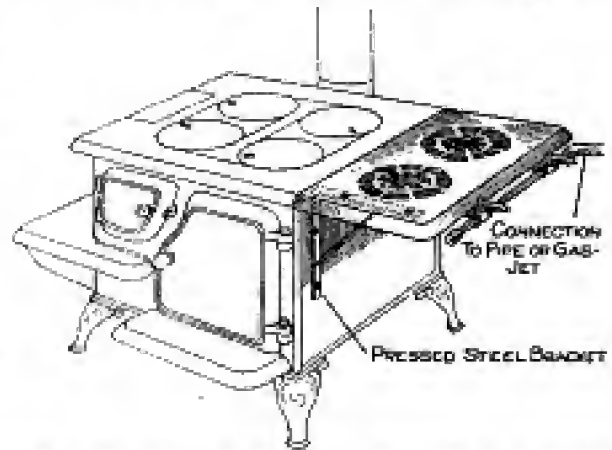
The Frame Guides the Canoe into the Locker and Makes It Easily Handled

ier, besides avoiding the wear and tear otherwise produced in storing the canoe. For this purpose a wooden frame should be provided to fit the canoe, and a screw eye, or pulley, fastened in the center of the top and bottom pieces. The frame must be guided and suspended by two wire cables, securely fastened in the locker.

In using the device, the frame is first pulled to the front of the locker. The canoe is turned upside down, and one end slid into the frame; then, by supporting the other end, the canoe may be easily pushed into the locker, or as easily withdrawn when required.—Contributed by H. A. Weddell, Chicago, Ill.

Gas-Plate Attachment for a Coal Range

In the place of the shelf which came attached to the range stove I fastened a two-burner gas plate. The legs on



Gas Plate Attached with Two Sheet-Metal Brackets on a Coal Range

the gas plate were removed, and the burner part was attached with two small pressed-steel brackets, purchased from a local hardware dealer. With this arrangement the gas plate not only answers all the purposes of the original shelf, but it converts the range into a first-class combination gas and coal stove.—Contributed by W. R. Humelbaugh, New York City.

To Make a Long Rope Short without Cutting

Double the rope in the center or at a point where it will not strike obstacles, such as pulley blocks, to get the required length; then put a half hitch in the rope near each end of the doubled part. Adjust the half hitches



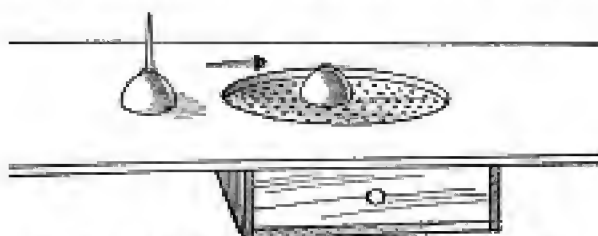
A Part of the Rope Doubled and Half Hitches Made over the Looped Ends

over the looped ends as shown. The rope will stand any strain up to its limit.—Contributed by W. J. Tolson, Lyons, Ia.

¶To prevent scoring rule from cutting the ink rollers, place a small heavy-faced rule at each end.

Preventing Waste in Filling Oilcans

In stock rooms, or places where oil is supplied to men through a window, a considerable amount is usually

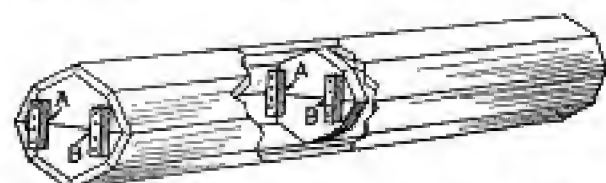


An Oil-Tight Drawer Catches All the Drip from Cans being Filled at the Window

spilled or dripped from the cans being filled. In wiping this up a dangerous accumulation of oily rags, or waste, results. This can easily be avoided and an appreciable oil saving effected by the means illustrated. A portion of the window sill is cut out, and covered with a perforated plate or wire screen. Under this is placed an oil-tight drawer, or receptacle, for catching the oil as it drips from the cans, which may be removed as desired or necessary.—Contributed by George Jaques, Chicago, Ill.

Turning a Long Cylindrical Pattern

One of the chief difficulties in turning long cylinder patterns is the tendency of the joints to open. Pinch



A Long Cylinder Pattern Held Together Temporarily with Blocks While Turning the Staves

dogs, ordinarily used to hold the two halves together, require resetting as the turning progresses and also frequently work loose. These difficulties may be overcome by joining the halves of the heads by means of blocks, A and B, as shown in the sketch. The head pieces are first fitted for dowel pins in the usual way, after which one half of the cylinder may be formed. Then the heads should be put together and the strips A and B

nailed or screwed to them; the end heads should have the pieces on the outside so they may be easily removed when the pattern is turned up. After having assembled and turned the cylinder, it may be separated into halves by first removing the pieces A and B from the outside heads. Then wedge the halves of the cylinder apart slightly so as to allow a thin saw or hacksaw blade to enter, with which the strips on the center head may be cut in two.

Removing a Broken Knuckle Pin on a Railway Car

Some makes of drawbars are equipped with lugs directly below the knuckle-pin hole, to keep the lower part of a broken pin from dropping out, and if a pin is broken without it being quickly noticed, the lower end is liable to become battered and bruised to such an extent that it cannot be easily removed.

In cases of emergency, remove the top part of the broken pin, take a pin of the same size, or one a little smaller, and drop it into the hole as far as possible, then force it through with a heavy hammer. This will force out the broken part as well as the lugs on the lower side of the drawbar, and replace the new pin.—Contributed by D. C. Lautz, Centralia, Wash.

Preventing Gear-Box Trouble

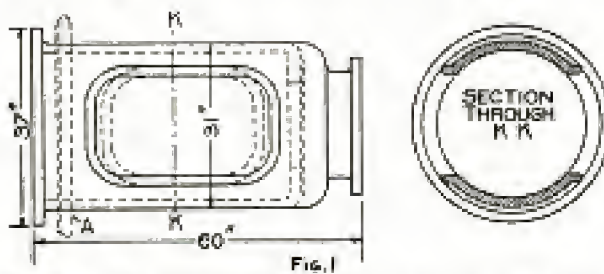
When making repairs on the gear box of an automobile, be sure to keep the opening covered to prevent anything falling into the box. One owner had to pay the price of two new gears because a careless workman allowed the box to remain open and a nut dropped in without his knowledge. The nut got in the gears while traveling on the road and ruined them. A thorough examination should be made of the box prior to pouring the grease in, to make sure that it is freed from anything that may have accidentally dropped into it.

Stopping Off Pump-Yoke Pattern for New Design

By J. A. SHELLEY

It frequently occurs in figuring on new designs, that an old pattern can be changed, by additions and stop-off pieces, to serve the purpose for the new design without spoiling the former. In shops where castings of one kind are made in great numbers, it is not advisable to use patterns with stop-off parts, but where a large pattern is used only occasionally, and with slight changes will answer for a new design, stopping off is economical and practical. In complicated work of this nature, it is usually necessary that the molder understand drawings, and have them at hand to avoid mistakes.

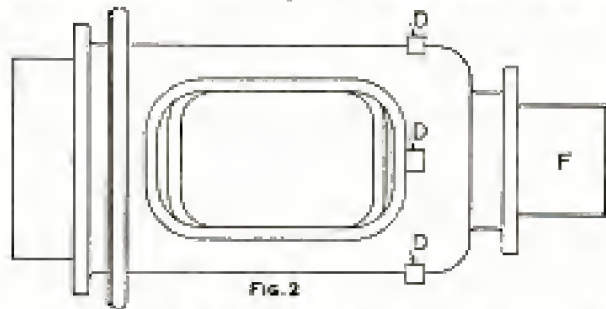
Figure 1 represents, by the full lines, a design for a steam-pump yoke,



Full Lines Represent the Yoke Pattern and the Dotted Ones Indicate the New Design Wanted

which it is desired to change as indicated by the dotted lines. The side opening on the pattern, Fig. 2, can be reduced by filling in with the proper thickness of wall and adding a new flange. If the flange on the original pattern is loose, it may be removed, otherwise it will be necessary to fill in that part of the mold as shown in Fig. 3. In shortening the yoke, two new end flanges are necessary. At one end, A, Fig. 1, the change can be made by adding the new flange to the original pattern. It will be further necessary to change either core box or mold; if the core box is changed, it should be enlarged, as shown by the dotted outline B, Fig. 4. It may be simpler for the molder to make the necessary change in the mold, which can be done by leaving the new flange in position,

then filling in with molding sand that part, C, Fig. 3, formed by the cut-off portion of the original flange and yoke.



The Exterior Appearance of the Combined Old and New Patterns with Core Prints

To form the new flange at the other end, three prints, D, Fig. 2, should be placed on each half of the yoke pattern; these being necessary for locating the stop-off piece shown in Fig. 5. This should correspond to the desired exterior shape of the new design. It should be provided with prints, E, corresponding to the prints D, Fig. 2, and with a core print matching the original print F, of Fig. 2. If it is desirable to shorten the dry-sand body core, it may be done in the core box by stopping off with circular pieces. If the end F, Fig. 3, is thus removed, it will be necessary to fasten a batten, G, Fig. 5, on the piece H, also shown in Fig. 5, so this

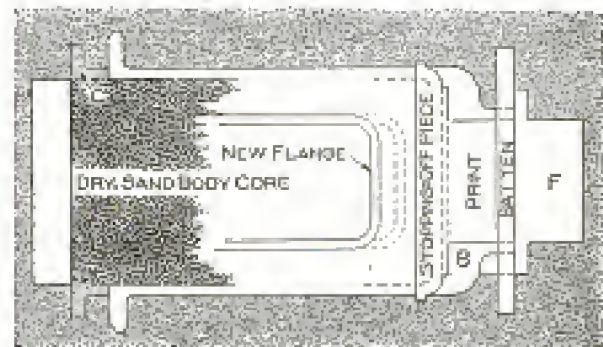


FIG. 3

Plan of Mold Showing Method of Stopping Off the Unused Flanges of the Original Pattern

may be held in proper position in the mold, the batten resting on each side. With the piece H in the mold, the spaces formed by the original pattern

should be filled in with molding sand, thereby forming the exterior shape for the new design. The body core box

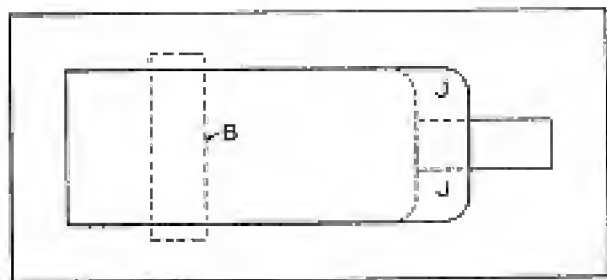


FIG. 4

Plan of Body Core Box with Changes for New Design Indicated by Dotted Lines

must be provided with a loose piece, J, Fig. 4, corresponding to the inner side of the new flange. With the changes made as described, considerable time and money is saved, which

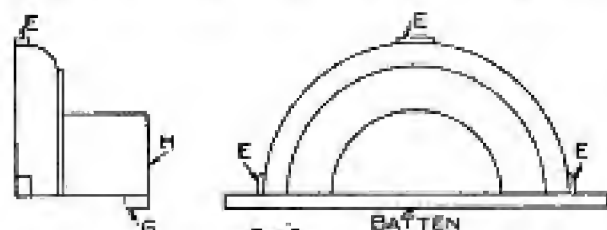


FIG. 5

A Batten Attached to the Core Print to Hold It in Position in the Mold

would have been necessary for an entirely new pattern producing the same results.

Reclaiming Old Gold

To sell scrap gold to the United States Mint, it must be reduced to almost pure gold or about 24 carat, says the Keystone. Melt the junk and roll it into very thin sheets. Place them in a bowl, so that the pieces will not lie together, and pour chemically pure nitric acid over them. This will separate the gold from the base metal, the latter being dissolved and the gold forming a powder on the bottom of the vessel. After this powder has formed, pour off the acid, put water into the vessel, and shake well, after which allow it to settle, then pour off the water. Repeat this washing several times to clean the powder of acid. Allow the powder to dry, and put it in a crucible with some flux—pearlash or

bicarbonate of soda. Melt it into a lump in the bottom of the crucible. This will be almost fine gold, but not absolutely pure. While melting, be careful not to inhale the fumes, as the remaining acid that cannot be washed out is very injurious to the lungs.

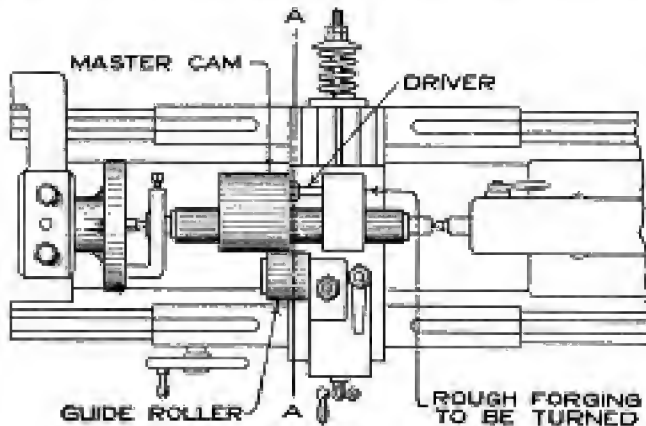
Turning Cams on a Lathe

There are many different ways of turning rough cam blanks on a lathe, to match master cams, but one of the simplest is that shown in the illustration. The master cam for this purpose should be somewhat wider than the regular finished blank, so that the guide roller may have a continuous bearing even though the cam-cutting tool is not in contact with the cam. The regular cam blanks should first be bored, faced, and keyseated, as required, and then machined for the desired outline. To do this, the master cam and work blank should be put on the same arbor, alined with a key, and fastened in place. In case no key fastening is to be used, the master cam may be drilled and tapped for a suitable stud, and a hole correspondingly drilled in the work blank to fit the stud. When alined and fastened on the arbor, no slipping will occur unless both cams slip together.

On the tool rest, to one side of the tool post, can be bolted the guide-roller bracket. This consists of an iron block provided with a horizontal pin at one side, on which the guide roller is held. The pin can be made separate if desired. In that case, the block should be drilled to fit the roller pin, and a groove cut through on one side, to clamp the pin in place. A hole is drilled through the bracket so that it may be bolted to the tool rest with a T-bolt and nut. This not only holds the bracket in place, but also securely clamps the roller shaft.

In order that the roller bracket may slide back and forth, corresponding to the outline of the master cam, the slide-rest screw should be removed, and a smaller, loosely fitting rod put in its place. This should have sufficient

length and be threaded on each end, so that two locknuts can be screwed on the front end, while, on the opposite side, must be a compression spring, with a washer at each end, all held in place with locknuts. The compres-



A Master Cam is Fastened on the Shaft with the Part to be Turned and It Controls the Tool Post of the Lathe, Thereby Causing the Cutting Tool to Turn the Blank into a Cam

sion spring must allow the guide roller to travel from one extreme point of the master cam to the other, and as the lathe tool is fastened to the same slide rest, an outline will be cut on the work blank exactly corresponding to that of the master cam. To obtain successive cuts across the work, the tool must be reset for each cut.—Contributed by J. V. Romig, Allentown, Pa.

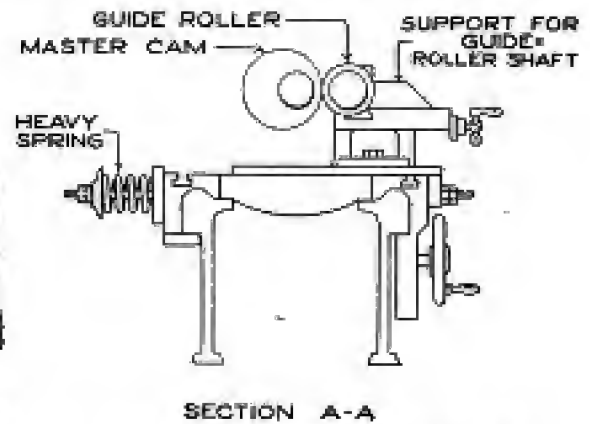
Restoring Faded Writing on Old Manuscript

To restore faded or effaced ink writing in old manuscripts, moisten the writing with freshly made "sulphhydrate of ammonia" (SH, NH_3), and in a few moments the letters become plainly visible. A fresh solution in water is colorless, but turns yellow quickly when exposed to air. The surplus chemical is removed by washing with cold water, and the paper is then dried by slight heating or with blotting paper. If the writing again fades after this treatment, a tannin solution should be applied. This process is only useful for restoring ink made with gallic acid.

☞ When printing gummed paper dampen the floor about the press thoroughly.

Homemade Engine-Driven Tire Pump

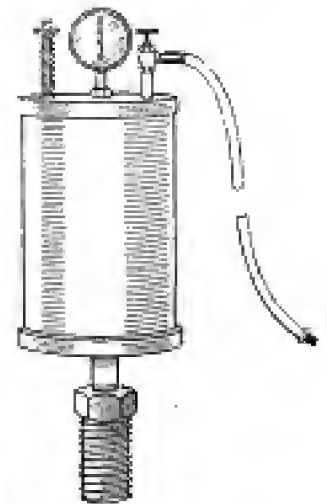
The long and laborious operation of pumping up tires with a hand pump can be easily and cheaply replaced by



the homemade, pistonless pump illustrated. The parts necessary for its construction are as follows:

- One spark plug.
- One $\frac{3}{8}$ -in. close nipple.
- Two 2-in. pipe caps.
- One 2-in. pipe nipple, about 3 in. long.
- One motorcycle-engine inlet valve.
- Three $\frac{1}{8}$ -in. pipe nipples.
- One $\frac{1}{8}$ -in. globe valve.
- One pressure gauge.
- Sufficient length of hose to reach all tires from the engine.

One of the pipe caps should be drilled and tapped in the center for the $\frac{3}{8}$ -in. close nipple, the other is drilled and machined to fit the motorcycle inlet valve, and provided with two $\frac{1}{8}$ -in. pipe openings, leading to the outlet valve and pressure gauge, through the $\frac{1}{8}$ -in. nipples. The two caps are screwed on the 2-in. nipple. The spark-plug nut, or that part which screws into the cylinder head, is drilled and tapped for a $\frac{3}{8}$ -in. pipe thread, and connected to the lower 2-in. flange



with the $\frac{3}{8}$ -in. close nipple, completing the pump.

When it is necessary to pump up the tires, one of the engine spark plugs should be removed and the pump screwed into its place. The engine is then run free. The compression in the attached cylinder will force the air, which has been sucked in through the pump inlet valve, out through the regulating valve and through the hose into the tire connected to it. The time required to change from spark plug to pump and back again amounts to very little, while the labor saved and satisfaction gained by its use, if figured in dollars and cents, would pay for it in short order. Its compactness permits easy storing in the tool box.—Contributed by A. H. Waychoff, Koenig, Col.

Indicator for Testing Centering of Work on a Lathe

When work is attached to a lathe faceplate, or in a chuck, it is frequently necessary to test the setting with an



Test Indicator for Setting Parts to be Machined True on the Faceplate of a Lathe

indicator in order to obtain accurate results. The sketch represents a simple design of indicator that can be easily made; answering the purpose as well as an expensive instrument. It will be necessary to provide a bent strap of metal, A, carefully drilled through the two ends so the holes line up accurately. On one side is fitted a pin machined to pointed centers at each end; one end, B, pointing toward the outside, and the other, C, projecting into the space formed by the bar A. In the opposite hole is fastened a metal bar, D, about 5 in. long, carefully ground to a point on the outer end, corresponding to the center of the rod.

In order to hold the indicator in position a strip of spring steel, several

inches long, should be provided and fastened to a bar, F, suitable for being held in the tool post. A slot, H, is cut into the fastened end of strip E, for adjusting it, and a small hole, G, drilled through the outer end for holding the indicator.

When necessary to use the indicator, the bar F is fastened in the tool post, and the strip E adjusted so the hole G will line up exactly with the lathe centers. When this has been done, no further adjustment should be made that will in any way throw the hole out of line. The indicator can then be held in position, with the center B fitting in the center prick-punch mark of the work, and the end C fitting in the hole G of the spring strip. When the work is rotated the end D will describe a circle, if the setting is off center, until perfect alignment is obtained, when the point D remains stationary, as the three centers D, C and B, as well as the work center, are then in line with the lathe centers.—Contributed by J. J. Kolar, Maywood, Ill.

Lead-Pencil Sharpener

The illustrated lead-pencil sharpener was made of No. 24 gauge sheet metal, forming a cone open at both ends with flat edges flanged out on the sides. A suitable piece of sandpaper can be cut out and fitted to the inside of the cone, with sufficient length to allow the two ends to pass out through the opening on the side. All surplus stock is cut off from the ends of the cone, and the remaining part trimmed and held in place under the bent-over edges of the



Two Positions of the Sharpener in Making a Round and a Flat Point on a Pencil

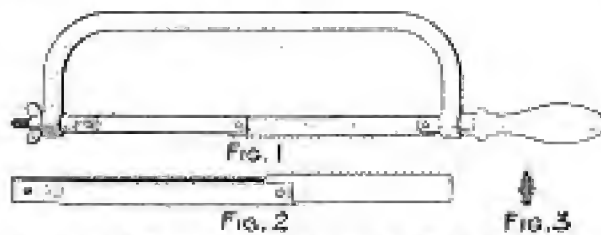
flanged sides. When sharpening the pencil for a round point, the inside of the cone is used; for a chisel point, use the flat sides.

Preventing Rats from Gnawing Insulation from Wires

A telephone line that had been "fished" under a floor gave considerable trouble and had to be connected with new wires from time to time, owing to the rats gnawing the insulation and causing a ground. Several remedies were suggested and tried out, but all failed until a pair of lines was coated with white shellac as it was drawn in place. This ended the trouble, and the line has been in use for more than a year.—Contributed by C. W. Elliott, Toronto, Can.

Holding Broken Hacksaw Blades in a Frame

A method of holding broken blades in a hacksaw frame is shown in the sketch. The arrangement consists of a bent-over strip of sheet iron provided



A Piece of Sheet Metal is Used to Hold the Broken End of the Blade

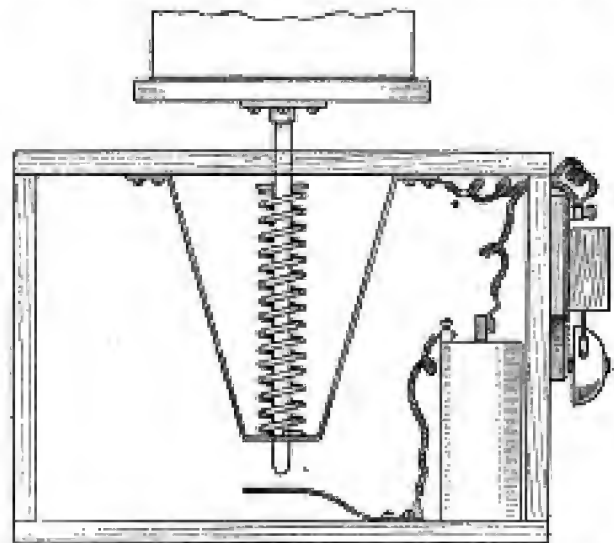
with a hole in each end. The end that hooks over the pin on the saw frame is hammered flat, and the other end is placed over the saw blade and fastened with a rivet, or small bolt. The temper must be drawn from the blade before a hole can be drilled in it.—Contributed by Wm. A. Robinson, Waynesboro, Pa.

Alarm for Filling Cans with Thick- Flowing Fluids

During cold weather we had trouble with the cylinder oil running slow, and many a can was run over for the reason it was allowed to fill without attention. For an alarm to warn us when the can was about full, we constructed the device shown in the sketch.

It was made of an ordinary wood

packing box with a V-shaped piece of flat iron, $\frac{1}{8}$ in. thick, to guide the stem, which was a $\frac{1}{2}$ -in. rod surrounded by



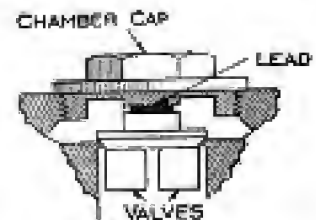
The Electric Circuit is Closed When the Weight of the Liquid is Correctly Measured

a spiral spring. A flat spring at the lower end serves to make contact when the proper weight has been reached. The device can be adjusted by filling the measure or can, and setting the spring to the proper tension after which it will need no attention. The bell will ring when the can fills to the level it is set to measure.—Contributed by C. C. Heyder, Hansford, W. Va.

Method for Finding Lift of Valve without Instruments

A simple means of determining the available lift or rise of a valve without the use of instruments, is by compressing a piece of

lead or similar soft material between the top of the seated valve and the inner side of the chamber cap. Having

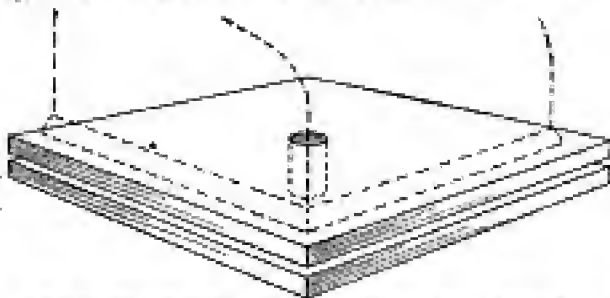


turned the cap to its usual position, it may be unscrewed and the lead measured for thickness, this representing the distance of available lift.

It is always best to hang belt shifters vertically when the belt is on the loose pulley.

Turntable for a Cash Register

By the use of a turntable, as shown in the illustration, it is possible to have a cash register on a counter for use



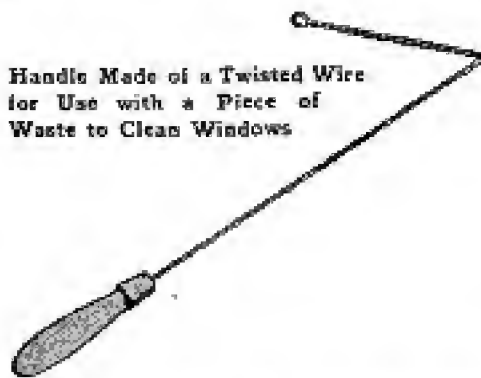
A Pivoted Table That Will Permit the Use of a Cash Register from Both Sides of a Counter

from either side. The device simply consists of two symmetrical boards, centrally pivoted by a large pin of sufficient length to keep the boards slightly separated. The register is placed on the platform, balancing the top board as closely as possible, and can then be turned in any direction.—Contributed by A. B. Shaw, N. Dartmouth, Mass.

Window Cleaner for the Railroad Engineer

In the winter time the damp snow often clings to the little narrow window in front of the engineer and ob-

Handle Made of a Twisted Wire for Use with a Piece of Waste to Clean Windows



structs his view. As it is not pleasant or safe to crawl out on the running board to clean the window, some person devised the cleaner shown. It is made of a heavy wire twisted and bent to make a loop at the outer end.

In use, a piece of waste is pulled through the loop; the engineer then opens the window at his side and,

reaching around the outside corner of the cab, swabs off the front window. The dimensions of the cleaner will be determined by size of the cab.—Contributed by Clyde L. Adams, La Grange, Ill.

Protecting Sleeve for a Tailstock Center

Great accuracy is usually required in grinding machine work. The centers of the machine and the center holes of the work must therefore be carefully guarded in order not to nick or bruise them in any way. By means of the protecting sleeve illustrated this difficulty is overcome.

The sleeve is made to fit the machine center nicely, and turned out to fit the work to be ground approximately, allowing a slight clearance all around the



Protecting Sleeve for the Tailstock Center to Prevent the Grinding Wheel from Striking It

circumference. In order to secure easy centering, the inner edges of the sleeve are made slightly rounded. This guides the work to its running position safely and rapidly, avoiding the painstaking centering operation otherwise necessary. One side of the sleeve must be cut away sufficiently to allow the grinding wheel to pass when running off of the work.

Restoring White Shellac to Its Original Color

If kept in tin cans, white shellac will often lose its color and turn a rusty brown. It can be restored in the following manner: Pour it into a wooden pail and stir with a long stick reaching to the bottom of the pail, at the same time adding dry oxalic acid, until the whiteness returns; then strain through cheesecloth into another can. White shellac, if kept in glass, stone, or wooden jars, will not lose its color readily.—Contributed by G. P. O'Brien, New York, N. Y.

To Determine the Resistance of Two Coils in Parallel

By A. E. ANDREWS

The combined resistance of two or more coils, or resistances, connected in series is obtained by merely adding the resistances of the respective coils, and the sum total is the resistance of the combination. Thus, if three resistances of 15, 25 and 18 ohms, respectively, are connected in series, their combined resistance will be 58 ohms.

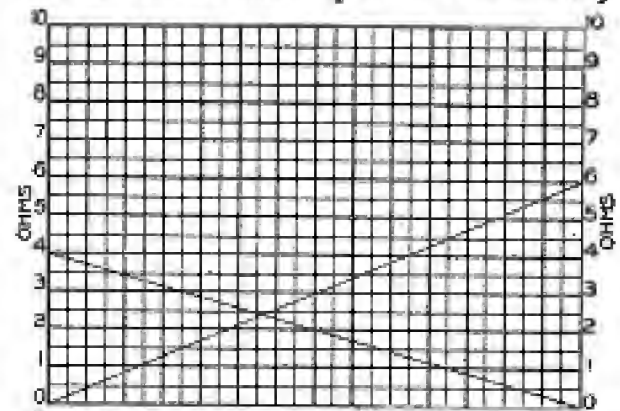
When resistances are connected in parallel, the procedure in determining their combined resistance is more tedious than in the case of the series connection, and for this reason the following graphical method will be found a great time saver and at the same time sufficiently accurate for almost all commercial purposes. The chart to be used in making the graphical solution should be constructed as follows:

Obtain a sheet of cross-section paper used in all engineering offices, having at least 100 vertical lines and 100 horizontal lines. The number of vertical lines is not so important as that of the horizontal ones. On each vertical edge of the paper lay off the scale of resistances, allowing at least 10 horizontal lines per ohm, which gives a total of 10 ohms on each side if there are 100 horizontal lines.

To use the chart proceed as follows: Suppose it is desired to find the combined resistance of a four-ohm coil and a six-ohm coil when they are connected in parallel. Draw a line from the lower left corner of the paper over to the four or six-ohm point on the right vertical edge; in the instance shown, to the six-ohm point. Draw a line from the lower right corner over to the four-ohm point on the left vertical edge. Trace along the horizontal line that passes through the point where the two lines just drawn intersect until it touches the right or left vertical scale. The value at the point where this line passes through the scale represents the combined resistances of both coils in parallel. The intersection point in this instance is on

line 24, not counting the lower line, and represents 2.4 ohms.

Resistances higher than 10 ohms may be handled by increasing the value of the vertical scale in ohms. Thus each scale may be multiplied by 10, and resistances up to 100 ohms may



Each Line in This Diagram Represents Five Lines on Cross-Section Paper

be handled. If 60 and 40 ohms were added the result would be 24.0 ohms, or just 10 times what it was with the four and six-ohm coils. In adding resistances above 100, both scales may be increased by multiples of 10 to meet the requirements. The value of one scale cannot be increased alone, but both must be increased together, and the result is determined on the basis of the increased scale.

The accuracy of the results may be increased by using a much larger sheet of paper with more lines on it, say, 1,000 each way, and laying off the scale with 100 lines per ohm.

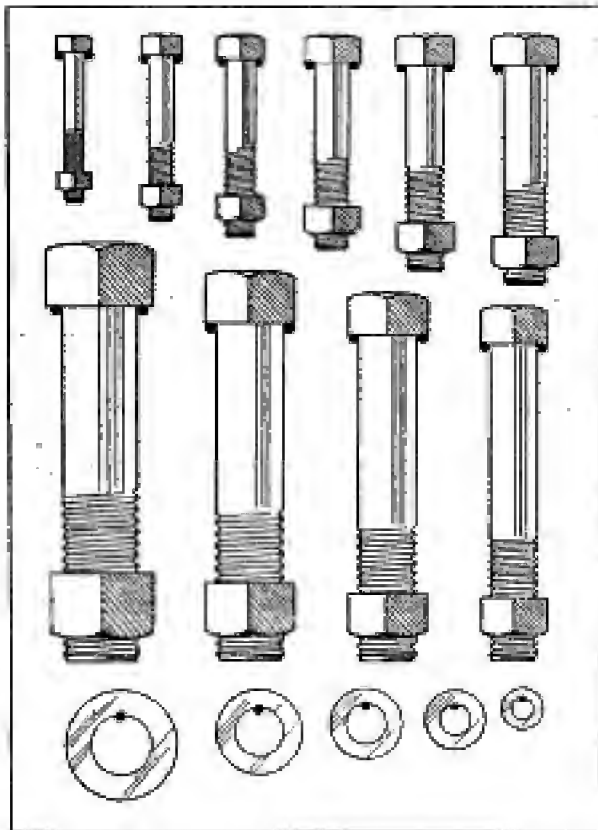
The following simple method may be used in determining the point of intersection of the two lines without actually drawing them. Mount the sheet of paper on a smooth board that may be placed or hung vertically in a convenient position. Obtain two pieces of fine thread considerably longer than the horizontal dimension of the paper, and attach one end of each piece to a small needle placed in the lower corners of the paper. Attach small weights to the other ends of the threads, and hang them over

two other needles placed on the points of the vertical scale. When the last two needles are placed on the scales properly, at the points corresponding to the resistances to be added in parallel, the two threads will intersect at a point corresponding to the intersection of the two lines, and the combined

resistance is determined as before. In order to correct for errors due to the thickness of the thread where it passes over the needles, these should be placed a trifle below their proper positions, the center of the thread then passing through the proper resistance point.

Bolt Rack

If bolts, nuts, and washers are not kept in special racks, they are very apt to be mixed up, and considerable time



Bolts, That are Used to Clamp Work on Machine Beds, Kept on a Rack

is lost in sorting out those required. The simple rack shown can be used to take all sizes and lengths. Any convenient-sized board is selected, and the bolts are arranged on it in successive lengths, starting with the smallest at one side of the board and increasing in size toward the opposite side. Directly under the longest bolt of the first row, the second row should start with the next size of bolt, and successively increasing sizes should be placed under

correspondingly decreasing sizes of the upper row. Any number of rows may be thus arranged, and space economized. The bolts are hung up by finishing nails driven into the board. Under the bottom row of bolts, the various sizes of washers may be hung up on nails, and arranged in succession. If several boards are used, it would be best to have only one diameter of bolt with all the desired lengths on each board.—Contributed by J. P. Kolar, Ithaca, New York.

House Number Cut in Window Shade

Before putting up the window shades for the front windows of a house, cut the house number in the shade, near the roller at the top when the shade is drawn out full length for the window. This will provide a means for visitors to find the house on the darkest night, as the light from the lighted rooms will show plainly through the stencil when the shade is drawn.—Contributed by O. M. Southworth, Benton Harbor, Michigan.

To Hold a Cap Screw

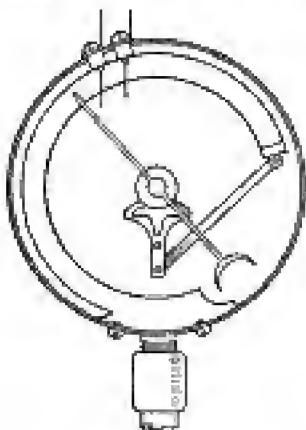
Machine designers usually call for the use of through bolts instead of cap screws wherever possible. The ordinary cap screw, or tap bolt, has a habit of working loose which is often disastrous in its results. There is no chance to put a nut on the "far" side to lock it, and if used in cast iron, the average tapped hole is of such size that it makes a loose fit for the screw which soon jars out. If it is set up tightly, the screw is strained beyond the safe point, or it is twisted off.

Various methods have been em-

ployed to keep tap bolts in place, but one that can be worked without preparation or expense is as follows: A split washer, now so familiar to the automobile trade, is put under the head before screwing it down. These washers are made of special spring steel, split and given a twist, then tempered. The twist, when flattened out, puts a constant tension on the cap screw, and in many cases will be the means of keeping a screw tight, just as it keeps a nut tight. Its cheapness and general availability make it a valuable aid.

An Electric Steam-Pressure Alarm

In a small manufacturing plant three boilers are used to supply the power and are carrying a full load in running the machinery of the establishment. At times during the day, and quite frequently at that, portions of the machinery is stopped, and the pressure rises to the blowing-off point. The superintendent was in the habit of becoming very excited when the safety valves of the boilers would open up, as he considered this a needless waste of fuel. The engineer consequently experienced a little irritation, as he had no way of knowing, unless informed immediately



by some one from the plant, that portions of the machinery would be shut down and the load lightened. The boilers, being forced to maintain the full load, would soon raise enough pressure to "blow off," before they could be cooled down a little by regulating the draft and the application of injectors, which were only used to safeguard the boilers in case of trouble with the feed-water line.

There were two large pumps used for filling a reservoir which were run with the boilers after the plant was closed for the day. The engineer could

at times catch the rise in steam pressure by opening the pumps, but sometimes the safety valves were forced to operate before he could drop other mat-

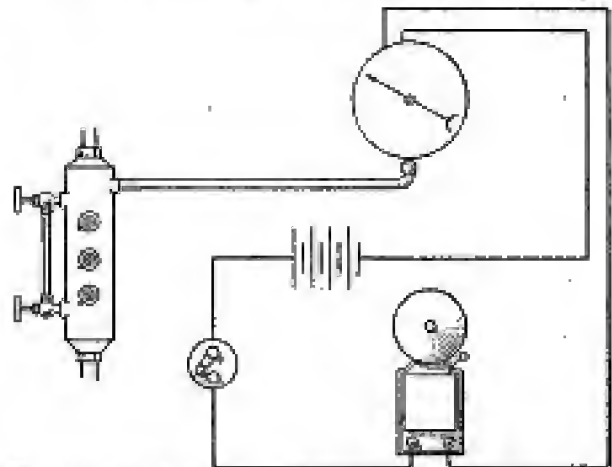


Diagram Showing the Connections of the Gauge with Steam and with the Bell Circuit

ters in the engine room and get to the pumps, located in a building some distance away.

The simple homemade electric alarm shown in the sketch was tried out with success. An old gauge was used to make it. Two small swinging contact strips of thin sheet copper were suspended from the frame of the gauge. The hand was set by another gauge so that it would push the strips together at a pressure a few pounds lower than the amount set to open the safety valves. The contact closed the circuit, which would ring a small alarm bell in the engine room that could be heard in any part of it. The pressure tap for the alarm gauge was taken from the column and led to the gauge, located on a small shelf near it.

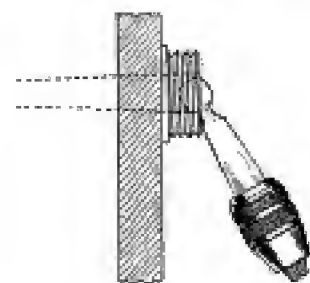
Usually an old gauge can be found in almost any engine room, and it need not register all pressures accurately, as any gauge can be set to show correctly at one point, although its adjustment may be in error for other pressures. The batteries and wire are inexpensive, and the arrangement in cases of this kind will relieve the engineer's mind to a great extent.—Contributed by F. W. Bentley, Missouri Valley, Iowa.

⚠ Paint is not always an insulator, and it should not be used on installed telephone apparatus.

Removing Drill Chuck Quickly from Miller Spindle

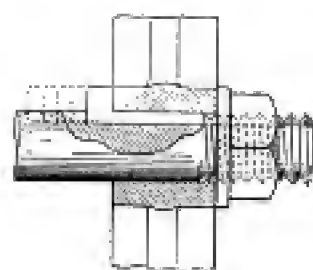
In the making of jigs and fixtures, it is often necessary to do drilling on the milling machine, and in so doing the chuck must be removed and replaced a number of times to substitute special boring or facing tools. After the work is properly located, it is very inconvenient to lower the table out of the way to drive out the drill chuck.

If a part of the drill-chuck shank is cut off, and the end formed as shown, it will not be necessary to move the work out of the way, as the chuck can be taken out and replaced in a very small space.—Contributed by Henry J. Marion, Pontiac, Mich.



Securing a Wheel in Place with a Threaded Key

In cases where an easy and frequent removal is required for a wheel, secured in a definite position on a straight shaft—not provided with a shoulder—a simple solution of the difficulty is to provide a threaded key, as illustrated. The key has a shoulder at one



end, against which the wheel is held. The other end is threaded at the same time the shaft thread is cut, so the two match when a nut is screwed on it. This key need not have the tight fit the usual drive keys must have in order to hold the wheel in position. When necessary to secure the wheel in place, it can be slid on the shaft together with the key, or this put on first, if desired, and the wheel slipped on afterward. The key is then placed so

that its threads and those of the shaft match, when the wheel fits in the desired position and against the key gib head. Then, by slipping on a loose collar and screwing on a nut, the wheel will be held rigidly on the shaft between the gib head and the collar. No sliding motion can result when fastened, and an easy removal can at any time be obtained by simply unscrewing the nut.—Contributed by F. P. Reidhaar, Connersville, Ind.

To Muffle Loud Noises in Telephone Receiver

On private exchanges, where the operator is liable to slam the receiver on the hook and make a noise that may injure the ear of the one listening at the end of the line, hold the receiver in the following manner:

Answer in the usual way and at the same time press the tragus of the ear close to the concha with the flange of the receiver, as if pressing the fingers in the ear to shut out any undesirable sound. The sound waves cannot enter the ear, as the tragus deadens the noise.—Contributed by H. W. Potter, Oakland, Cal.

Homemade Lift Pump

It is frequently desired to have a pump for emergency service where a tedious, slow bailing out with a pail would otherwise have to be resorted to. The pump illustrated can be cheaply and easily made, and will serve the purpose as well as an expensive manufactured article.

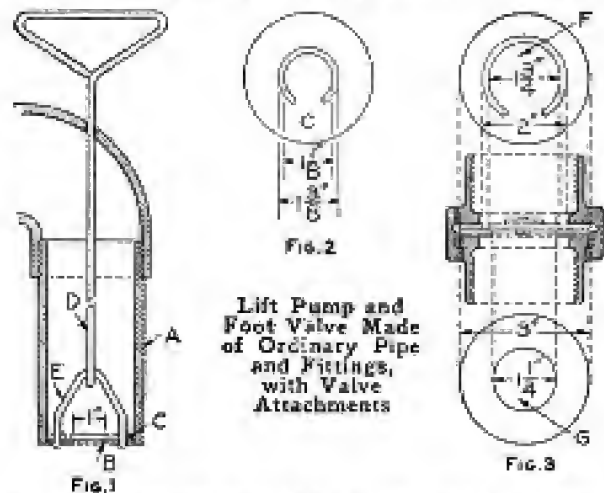
For the pump barrel, or cylinder, A, Fig. 1, a 2-in. piece of pipe, about 12 in. long, should be provided, and threaded at each end for standard pipe threads. The inside surface should be carefully filed and smoothed, to remove all irregularities. Three circular washers are required for the pump plunger: two of leather, or rubber, corresponding in size to the inside diameter of the pipe; the third, B, of hard wood, or

metal, slightly smaller than the pipe, and smoothed up on both sides, to form a water-tight joint for the plunger. This washer forms the seat of the plunger valve, and is provided with a 1-in. hole for the passage of water when pumping. In the upper washer C, Fig. 2, a narrow slot is cut so that the $1\frac{1}{8}$ -in. center piece, or flap, is attached only through a short strip, which acts as a hinge, allowing the flap to swing up or down, corresponding to the open or closed position of the plunger valve. To assist the flap in closing readily, a weight should be fastened to its upper side. The bottom washer simply acts as an additional plunger packing.

In order to attach the plunger to its rod, D, a bail, E, must be provided. This may consist of a piece of round bar, threaded at each end for standard nuts, and bent to the shape shown in Fig. 1. The three washers should be clamped together, and drilled to fit the parallel ends of the bail, after which the various parts can be assembled and fastened with the nuts, the upper ones acting as a shoulder against which the washers are drawn up by the lower nuts. If it is not convenient to thread the ends of the bail, a simpler construction would be to provide suitable metal washers, and solder them in the place otherwise occupied by the upper nuts. With the plunger disks in place, a small metal washer should be slipped over the projecting ends of the bail, and these riveted over to form a head. A suitable iron rod should be provided for the plunger rod, and one end securely bent around the bail, and soldered in place to prevent slipping.

For the discharge of the pump a 2-in. elbow will answer. In this should be drilled a hole providing a loose fit for the plunger rod to pass through. In assembling the pump, the discharge elbow is screwed onto the pipe A, and the plunger put in position with one end of the rod passing through the hole in the elbow, whereupon a suitable handle is bent on the plunger rod. Water can then be pumped, but it will be necessary to have the lower end

submerged all the time in order to draw up any water. It may not always be convenient to be so near the water, in which case a foot valve must be made

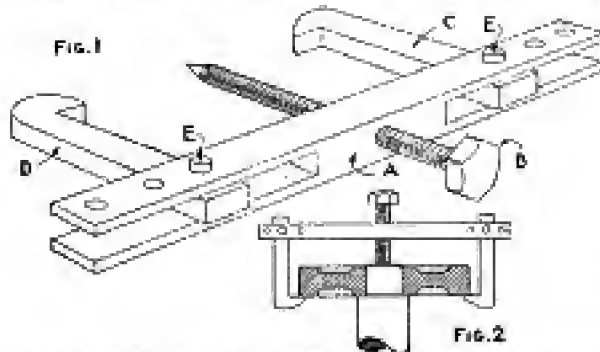


and attached to the lower end of the pump cylinder, with the necessary water line and fittings. In operating with a foot valve, the greatest vertical distance the pump can work at, will be 10 to 15 ft., depending on the water-tightness of the plunger in the pump cylinder.

The foot valve consists of a 2-in. pipe union provided with a flap valve similar to that in the plunger. Two leather washers should be made, as shown at F and G, Fig. 3. The upper washer F is provided with a hinged flap, acting as a valve. A 3-in. metal, or wooden, disk, with a $1\frac{1}{4}$ -in. hole through the center and both sides smoothly finished, can be used as valve seat for the flap to close against. A weight fastened to the flap will assist it in closing rapidly. In assembling the union, the usual rubber washer between the ends is omitted, and the three disks are inserted in its place, with the metal valve seat in the center, the flap disk at the top, and the plain washer at the bottom, to prevent any leakage through the union except through the main passage of the valve. The completed foot valve may then be attached to the pump, either with a length of plain pipe and coupling, as in a straight lift, or with a hose and necessary fittings, for places which can be reached only by a crooked suction line.—Contributed by G. M. Heimroth, Whitestone, L. I.

How to Make an Adjustable Sprocket and Gear Puller

Removing tightly fitting gears or sprockets from their shafts frequently requires considerable skill and patience,



Gears Tightly Fitting a Shaft can be Easily Drawn with the Puller and Spanner Wrench

but with the simple adjustable device illustrated, the job can be easily accomplished. The gear puller consists of: a crosspiece, A, Fig. 1; a forcing screw, B; pull jaws, C and D, and two bolts, E. The piece A may be of convenient length and proper thickness to suit the jobs it is most likely to be used on; for automobile-repair work, a $\frac{3}{4}$ -in. square piece, 7 in. long, would probably answer all purposes. The ends of the rod are slotted to fit the jaw pieces C and D, being $\frac{3}{8}$ in. wide in this case. Holes should be drilled, at varying distances from the center on each side, to fit the bolts E, so that the jaws C and D can be set at the places best suited for grasping the gear. The jaws consist of flat, L-shaped pieces, about 3 in. long. The piece A should be drilled and tapped through the center to fit the forcing screw B, which can be an ordinary standard bolt— $\frac{1}{2}$ in. in diameter in the case mentioned—tapered at one end to fit the shaft centers, and threaded all the way up to the head. In using this device, first fasten the pieces C and D in the holes best suited for gripping the gear; then, by catching it on the under side, as in Fig. 2, and turning the screw B, it can be easily removed.—Contributed by Adolph Kline, Newark, N. J.

CA small, sharp spade with a folding handle is a handy tool to carry on a touring trip.

Horsehair Used to Remove Particles from the Eye

The illustration shows a device for removing particles from the eye which I have found quite handy. The particles may be sometimes removed by pulling down on the upper lid until it laps over the lower one, then allowing it to draw back in place, but this method is not always successful.

The instrument for this purpose is made of a piece of wood, cut in the shape of a penholder for a handle, the small end being about $\frac{1}{8}$ in. in diameter. This end is cut, or split, and a horsehair inserted so that it makes a loop about $\frac{1}{4}$ in. in diameter. The hair can be fastened with wax or mucilage.

To remove a bit of dust, or the like, lift the upper lid, and move the horse-

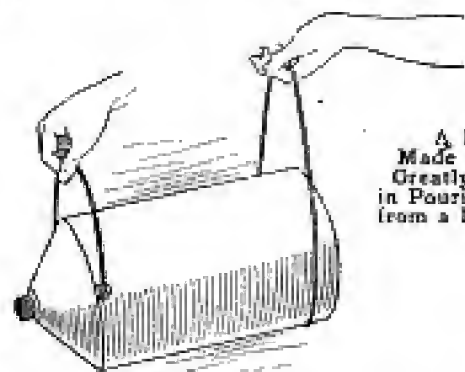


The Horsehair, Being Smooth, will Not Injure the Eye as It Is Moved over the Surface

hair around the ball of the eye. This will always get the intruder.—Contributed by Alfred R. Wagstaff, Lake Forest, Ill.

Pouring Liquid from a Large Can

Nearly all 5 and 10-gal. cans containing oils have only the regular handle for carrying purposes, and to pour the contents from such a can is not an agreeable thing to do, as one



A Loop Made of Rope Greatly Assists in Pouring Liquid from a Large Can

hand must be used to grasp the bottom, which is usually covered with oil and dirt. A loop of rope placed about the lower end of the can will prevent soiling the hands and also aid in the lifting.

Jan 1905 - 152 N.Y.C. 47
Feb 1911 - 297 A.M. 3-311
Nov 1916 - 787 A.M. -



An Ice Boat and Catamaran

By ROBERT K. PATTERSON

THIS combination is produced by using the regular type of ice boat and substituting boats for the runners, to make the catamaran.

In constructing the ice boat, use two poles, or timbers, one 16 ft. and the other 10½ ft. long, crossed at a point 2½ ft. from one end of the longer timber. The crossed pieces are firmly braced with wires, as shown.

The mast, which should be about 14 ft. long, is set into a mortise cut in the long timber, 15 in. from the front end, and is further stabilized by wires, as shown. A jib boom, about 6 ft. long, as well as a main boom, which is 11½ ft. long, are hung on the mast in the usual manner.

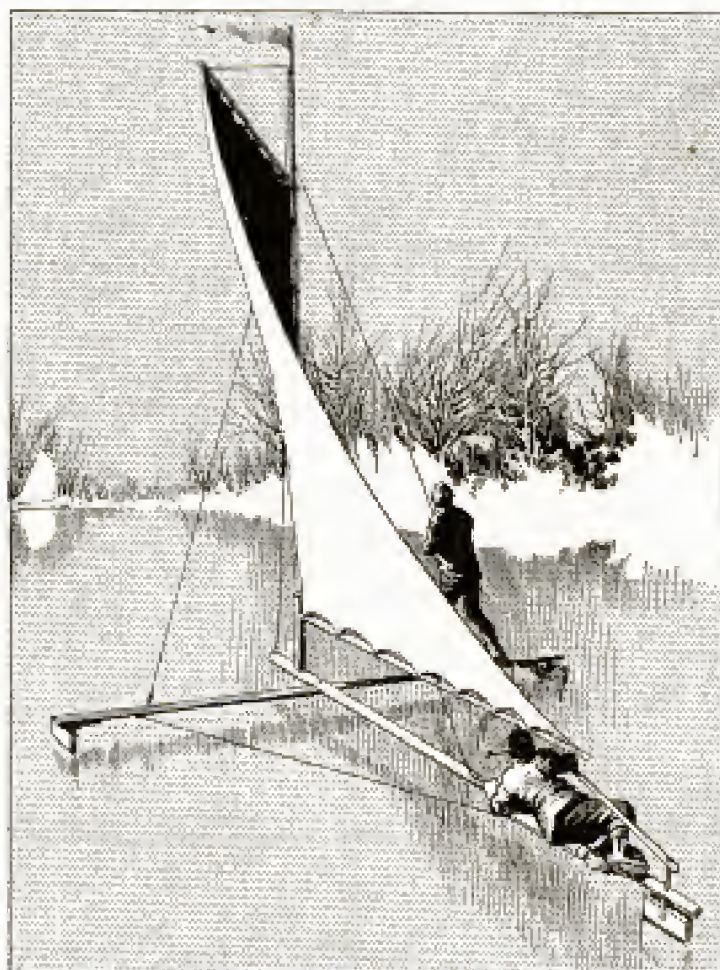
The front runners consist of band-iron strips, 18 in. long, 3 in. wide, and ½ in. thick, with one edge ground like the edge of a skate, and the ends rounding, which are fastened with bolts to the side of wood pieces,

18 in. long, 6 in. wide, and 2 in. thick, allowing the ground edge to project about 1 inch.

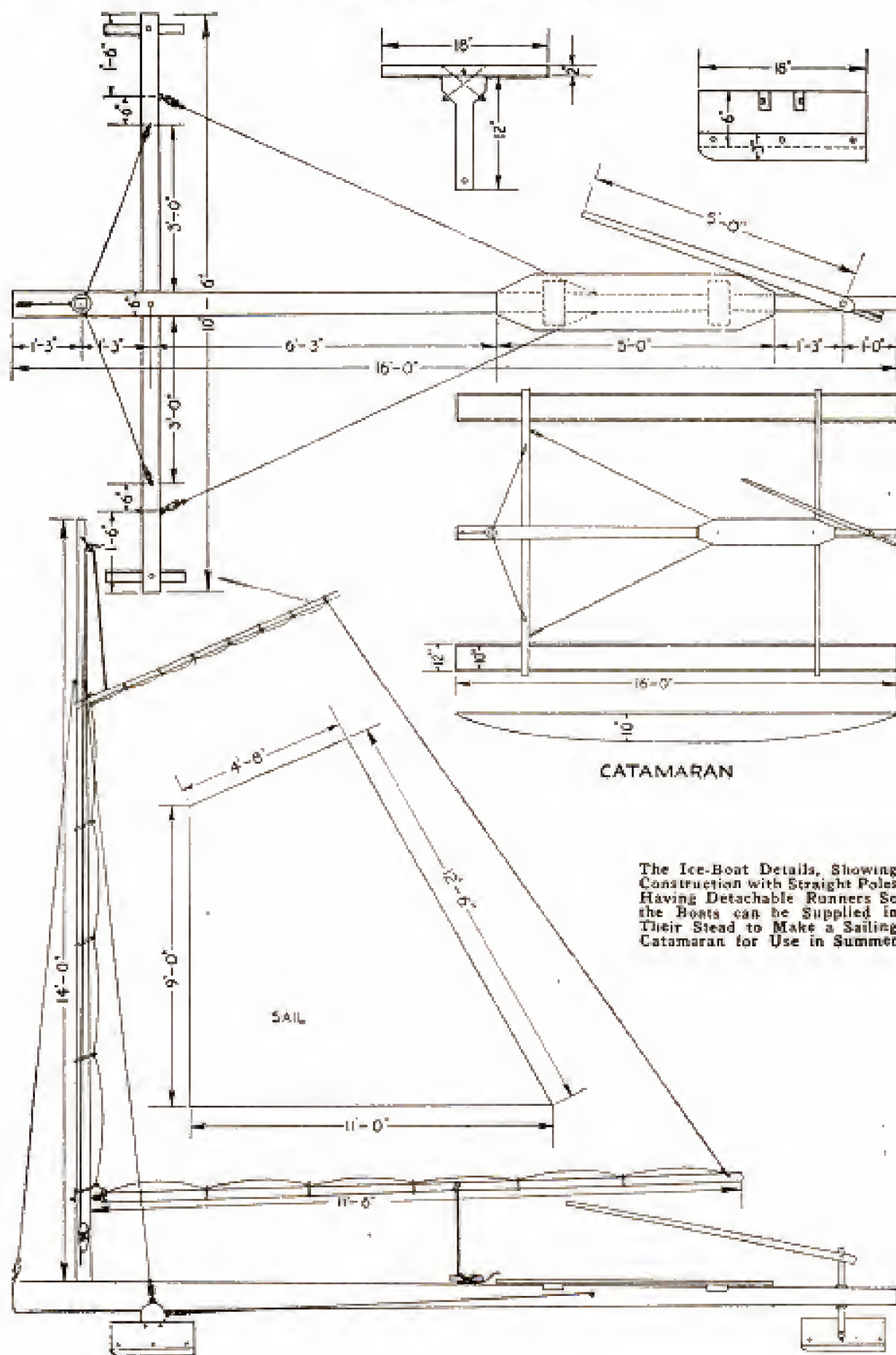
When the ice-boat frame is made of poles, the runners are attached to a piece of wood, 12 in. long, shaped as shown and fastened at right angles

with bolts running through the shouldered part diagonally. This makes a surface on which the pole end rests and where it is securely fastened with bolts. If squared timbers are used, the runners can be fastened directly to them. The rear, or guiding, runner is fastened between two pieces of wood, so that its edge projects; then it is clamped in a bicycle fork, which should be cut down so that about

3 in. of the forks remain. A hole is bored through the rear end of the long pole to receive the fork head, the upper end of which is supplied with a lever. The lever is attached to the fork head by



The Ice Boat Provides an Ideal Outing in Winter Where There Is a Body of Water Large Enough for Sailing



boring a hole through the lever end at a slight angle to fit the head, allowing sufficient end to be slotted, whereupon a hole is bored through the width of the handle, and a bolt inserted, to act as a clamp.

A board is fastened on two cross-pieces mortised in the upper part of the pole, for a place to sit on when driving the boat. The sail can be constructed of any good material to the dimensions given.

To rig up the ice boat for use as a catamaran, place a pole across the stern, the length of the pole being equal to the one used on the front part of the ice boat. Two water-tight boats are constructed, 16 ft. long, 12 in. wide, and 10 in. deep at the center. To make these two boats procure six boards, 16 ft. long, 10 in. wide, and 1 in. thick. Three boards are used to make each boat. Bend one board so that it will be in an arc of a circle, then nail on the two side boards, after which the edges of the sides are cut away to the shape of the bent board. The runners are removed from the ice boat, and the boats fastened to the pole ends. A rudder is attached in the place of the rear, or guiding, runner. The tops of the boats, or floats, can be covered and made water-tight.

Mind-Reading Effect with Cards

Five cards are shown, and some one person is asked to think of two cards in the lot, after which the performer places the cards behind his back and removes any two cards, then shows the remaining three and asks if the two cards in mind have been removed. The answer is always yes, as it cannot be otherwise.

To prepare the cards, take any 10 cards from the pack and paste the back of one card to another, making five double cards. Removing any two cards behind the performer's back reduces the number of cards to three, and when these are turned over they will not have the same faces so that the ones first seen cannot be shown the second time even though all five cards were turned over and shown.

An Air Pencil to Make Embossed Letters

The device illustrated is for making embossed letters on show cards, signs, post cards, etc. A small bulb, such as



The Oilcan Spout Is the Reservoir to Hold the Paint, and the Bulb Produces the Air Pressure

used on cameras, is procured, also the spout from a small oilcan. The bulb is fastened to the spout as shown.

The material for use in the pencil is quick-drying mucilage thickened with flake white. If some special color is desired, tint the mixture with aniline. Fill the spout with the mixture and attach the bulb. Squeeze the bulb gently while forming the letters, then dust over with bronze, and allow to dry.

An Endless Dish or Floor Mop

A good way to use up cord that collects about the house, is to make an endless dish or floor mop of it. Procure a thin board that will make a good length and wind the cord around it, then remove it from the board and tie the bunch together in the center.

A Developing-Tray Rocker

The tank method of photographic development is acknowledged as the best, yet there are many who, for vari-



Developing-Tray Rocker to Keep the Liquid in Motion over the Plate Automatically

ous reasons, still use the old-style tray method. For those who use the tray, a splendid and simple method that combines the good qualities of both the tank and tray is the tray-rocking device shown in the illustration.

The rocker consists of a wood box, 12 in. long, 9 in. wide and $11\frac{1}{2}$ in. deep, made of $\frac{3}{8}$ -in. material, together with a similar box $11\frac{1}{2}$ in. deep, that fits over the other as a light-proof cover. Both are given a coat of black paint.

At the center on the under side of the tray part, a right angle made of strap iron is fastened with screws. On the part projecting down, a hole is drilled to receive a sleeve made of a brass tube which is soldered in place. An or-

inary shelf bracket is procured, one end of which is filed and fitted with a strip of metal having both ends turned up slightly. Small-pointed pins are fastened in holes drilled near the turned-up part. The points of the pins serve as a knife-edge for the rocker. The extending end of the strap iron is fitted with a pendulum rod having a weight at the bottom.

The rocker is attached to the wall in a convenient place in the dark room. The tray with the developer and plate is placed in the box, which is light-tight, and the pendulum is started swinging.—Contributed by T. B. Lambert, Chicago.

An Adjustable Bookholder

A very satisfactory adjustable holder for books or letters can be constructed of ordinary materials. A board is used for the base, and two pieces, C, cut from the grooved edges of flooring boards, are fastened on top as shown. A permanent end, A, is fastened to one end of the base. A good-size holder is 19 in. long, 6 in. wide, made of material $\frac{3}{4}$ in. thick.

The movable slide B has two pieces attached to its under side, which are cut from the tongued edges of flooring boards. The piece D answers the double purpose of a handle and brace. A lock, E, is made of a bolt, having a long thread and a square head. A hole is bored from the under side through the brace, and a portion of the wood is cut out to admit the nut. A square place is cut out to admit the square bolt head in the bottom pieces. To



The Holder may be Used for Books or Letters and Papers as a File

lock the slide, simply screw the nut upward so that it will push the bolt head against the base.—Contributed by James M. Kane, Doylestown, Pa.



SNOWSHOES

HOW TO MAKE AND USE THEM

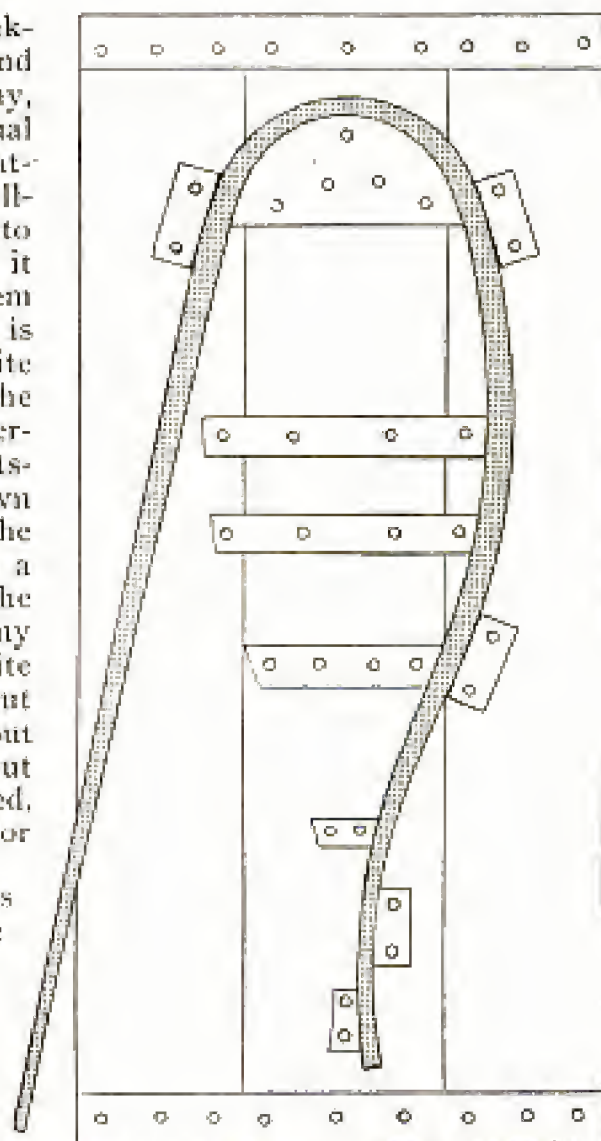
By Stillman Taylor

PART II—Making the Shoe

[In making the snowshoe it may be necessary to refer to the previous chapter to select the style, or to locate the name of the parts used in the description.—Editor.]

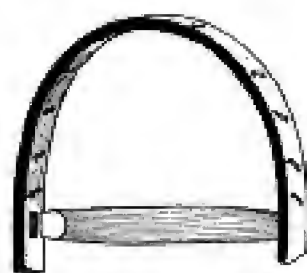
SNOWSHOE making is an art, and while few, if any, white men can equal the Indian in weaving the intricate patterns which they prefer to employ for filling the frames, it is not very difficult to fashion a good solid frame and then fill it by making use of a simple and open system of meshing. For the frames, white ash is much the best wood, but hickory and white birch are dependable substitutes, if the former cannot be obtained. Birch is perhaps the best wood to use when the sportsman wishes to cut and split up his own wood, but as suitable material for the frames may be readily purchased for a small sum, probably the majority of the readers will elect to buy the material. Any lumber dealer will be able to supply white ash, and it is a simple matter to saw out the frames from the board. The sawed-out frame is inferior to the hand-split bow, but if good, selected material can be obtained, there will be little, if any, difference for ordinary use.

When dry and well-seasoned lumber is used, the frame may be made to the proper dimensions, but when green wood is selected, the frame must be made somewhat heavier, to allow for the usual shrinkage in seasoning. For a stout snowshoe frame, the width should be about $1\frac{1}{8}$ in.; thickness at toe, $\frac{1}{8}$ in., and thickness at heel, $\frac{1}{6}$ in. The frame should be cut 2 in. longer



The Design of the Snowshoe is Traced on a Board, and Blocks are Used to Shape the Frame or Bow

than the finished length desired, and in working the wood, remember that the toe of the finished frame will be the



Locate the Cross Bars by Balancing the Frame, Then Fit the Ends in Shallow Mortises

center of the stick; the heel, the end of the stick, and the center of the shoe will lie halfway between the heel and toe.

After the frames have been finished, the dry wood must be steamed

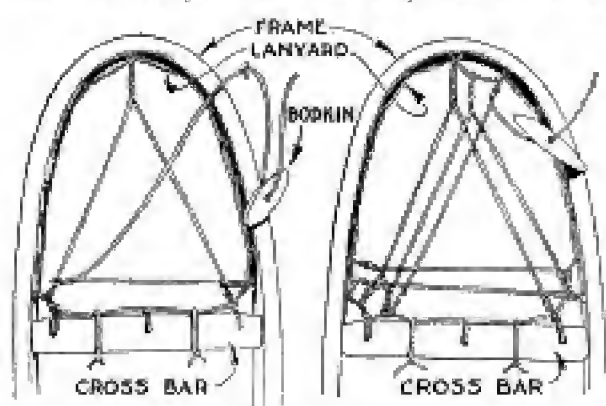
before it can be safely bent to the required shape, and before doing this, a wooden bending form must be made. An easy way to make this form is to first draw a pattern of the model on a sheet of paper, cut out the pencil mark, and, placing this pattern on a board, carefully trace the design on the wooden form. A number of cleats, or blocks, of wood will now be needed; the inside blocks being nailed in position, but the outside stay blocks being simply provided with nails in the holes, so they may be quickly fastened in position when the steamed frame is ready for the form.

To make the frame soft for bending to shape, steaming must be resorted to, and perhaps the easiest way of doing this is to provide boiling water in a

and pliable. After 10 or 15 minutes of the hot-water treatment, wrap the stick with cloth and bend it back and forth to render it more and more pliable, then use the hot-water treatment, and repeat the process until the wood is sufficiently soft to bend easily without splintering. The toe being the greatest curve must be well softened before putting on the form, otherwise the fibers are likely to splinter off at this point. When the frame is well softened, place it on the bending form while hot, slowly bend it against the wooden inside blocks, and nail on the outside blocks to hold it to the proper curve. Begin with the toe, and after fastening the outside blocks to hold this end, finish one side, then bend the other half to shape. The bent frame should be allowed to dry on the form for at least a week; if removed before the wood has become thoroughly dry and has taken a permanent set, the frame will not retain its shape. The same bending form may be used for both frames, but if one is in a hurry to finish the shoes, two forms should be made, and considerable pains must be taken to make them exactly alike in every way.

When the frames are dry, secure the tail end of the frame by boring three holes about 4 in. from the end, and fasten with rawhide. The work of fitting the two cross bars may now be undertaken, and the balance of the snowshoe depends upon fitting these bars in their proper places. Before cutting the mortise, spring the two bars in the frame about 15 in. apart, and balance the shoe in the center by holding it in the hands. When the frame exactly balances, move the bars sufficiently to make the heel about 3 oz. heavier than the toe, and mark the place where the mortises are to be cut. The cross bars and mortise must be a good tight fit, and a small, sharp chisel will enable the builder to make a neat job. It is not necessary to cut the mortise very deep; $\frac{1}{4}$ in. is ample to afford a firm and snug mortised joint.

The lanyard to which the filling is woven is next put in, by boring pairs



Begin Weaving the Toe Filling at the Corner of Cross Bar and Frame, Carrying It Around in a Triangle until Complete

wash boiler, place the wood over the top, and soak well by mopping with the boiling water, shifting the stick about until the fibers have become soft

of small holes in the toe and heel sections, and lacing a narrow rawhide thong through the obliquely drilled holes. Three holes are then bored in the cross bar—one on each side about $1\frac{1}{2}$ in. from the frame, and the third in the center of the bar; the lanyard being carried through these holes in the cross bar.

Begin the toe filling first, by making an eye in one end of the thong, put the end through the lanyard loop and then through the eye, thus making a slipknot. Start to weave at the corner where the bar and frame are mortised, carry the strand up and twist it around the lanyards in the middle of the toe, then carry it down and make a like twist around the lanyard loop in the opposite corner. The thong is now looped around the next lanyard (No. 2 from the cross-bar lanyard) and fastened with the twisted loop knot illustrated. Continue the strand across the width of toe space and make a similar loop knot on No. 2 lanyard on the starting side, twist it around the strand first made and loop it under the next cross-bar lanyard loop, then carry it up and twist it around the lanyard loop in the toe of the frame, continuing in the same manner until the last lanyard of the toe is reached, when the space is finished by making the twisted loop knot until the space is entirely filled. It is a difficult matter to describe by text, but the illustrations will point out the correct way, and show the manner of making an endless thong by eye-splicing, as well as illustrating the wooden bodkin or needle used in pulling the woven strands taut. This bodkin is easily made from a small piece of wood, about $\frac{1}{4}$ in. thick, and about 2 in. long.

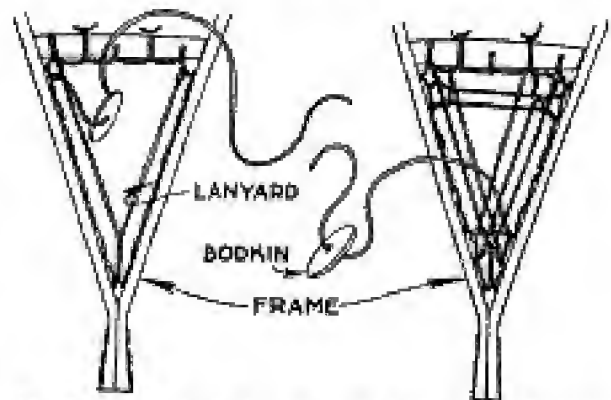


An Endless Thong is Made with Eyes Cut in the Ends of the Leather, and Each Part is Run through the Eye of the Other

To simplify matters, the heel may be filled in the same manner as the toe.

For the center, which must be woven strong and tight, a heavier strand of hide must be used. Begin with the toe cord first, and to make this amply

strong, carry the strand across the frame five or six times, finishing with a half-hitch knot, as shown, then carry



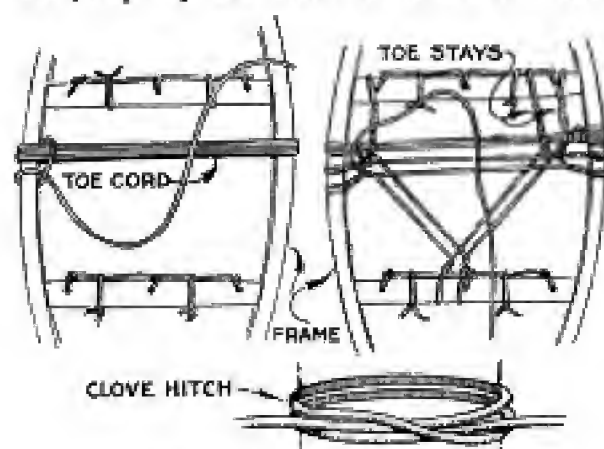
The Heel Filling is Woven by Making the Connection with the Lanyard in the Same Manner as for the Toe Filling

it up and twist it around the cross bar to form the first toe-cord stay.

As may be noted, the center section is filled by looping back and twisting the strands as when filling the toe. However, the filling is looped around the frame instead of a lanyard, and a clove hitch is used. A toe hole, 4 in. wide, must be provided for, and when enough of the filling has been woven in to make this opening, the thong is no longer looped around the cross bar, but woven through the toe cord. As the filling ends in the toe cord, it should be woven in and out at this point several times, finishing the toe hole by looping a strand around the cross bar at the side of the toe hole, then passing it down the toe-cord stay by twisting around it; then twisted around the toe cord along the filling to the other side of the toe hole, where it is twisted around the toe-cord stay on the opposite side, looped around the frame and ended in a clove hitch.

At the first reading, it will doubtless appear difficult, but a careful examination of the illustrations will soon show how the trick is done, and indeed it is really a very simple matter, being one of those things which are easier to do than it is to tell how to do them. The method of filling has been purposely made simple, but the majority of shoes are filled in practically the same manner, which answers quite as well as the more intricate Indian design.

The knack of using the snowshoe is quickly mastered, providing the shoes are properly attached, to allow the toe



The Center must be Woven Strong and Tight, and for This Reason a Heavier Strand of Hide must be Used.

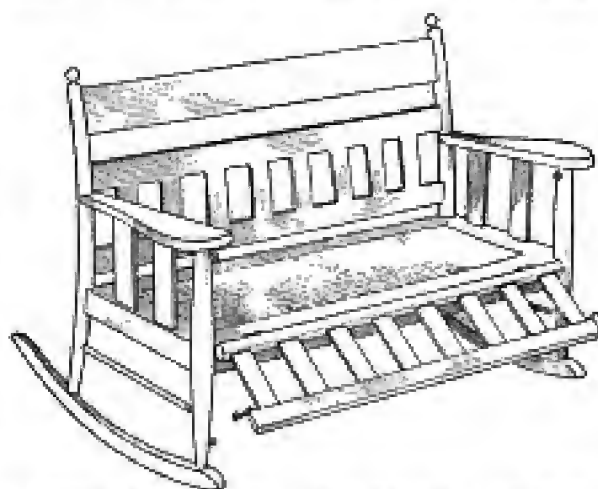
ample freedom to work down through the toe hole as each foot is lifted. The shoe is, of course, not actually lifted in the air, but rather slid along the surface, half the width of one shoe covering the other when it is lifted in the act of walking. At first the novice may be inclined to think snowshoes a bit cumbersome and unwieldy, and doubt his ability to penetrate the brush. However, as the snowshoer becomes accustomed to their use, he will experience little if any difficulty in traveling where he wills. When making a trail in a more or less open country, it is a good plan to blaze it thoroughly, thus enabling one to return over the same trail, in case a fall of snow should occur in the meantime, or drifting snow fill up and obliterate the trail first made. When the trail is first broken by traveling over it once by snowshoe, the snow is packed well and forms a solid foundation, and even should a heavy fall of snow cover it, the blaze marks on tree and bush will point out the trail, which will afford faster and easier traveling than breaking a new trail each time one journeys in the same direction.

A well-made pair of snowshoes will stand a couple of seasons' hard use, or last for a year or two longer for general wear. To keep them in good shape, they should be dried out after use, although it is never advisable to

place them close to a hot fire, or the hide filling will be injured. Jumping puts severe strain on the frame of the shoe, and while damage may not occur when so used in deep, soft snow, it is well to avoid the possibility of breakage. Accidents will now and then happen, to be sure, and as a thong may snap at some unexpected moment, keep a strand or two of rawhide on hand, to meet this emergency.

Combination Settee Rocker and Cradle

By fastening a frame with hinges to the front of a settee rocker, a combination piece of furniture can be made, which may be used either as a regular settee or as a cradle. For this purpose, a covered frame should be provided, being sufficiently long to extend across the front between the arm supports and having such a width that it will easily fit under the arms when hinged to the seat, as shown in the illustration. To keep the frame in position while serving as a cradle front, or when turned down for regular use, screw hooks are placed at each end, so that, in the former case, the frame, when swung up, can be secured in place by attaching the hooks to screw eyes fastened under the arm supports; while, for regular use, the frame is secured in its swung-



A Settee Rocker with a Front Attachment to Make It into a Cradle When Desired

down position by fastening the hooks into screw eyes properly placed in the front legs.—Contributed by Maurice Baudier, New Orleans, La.

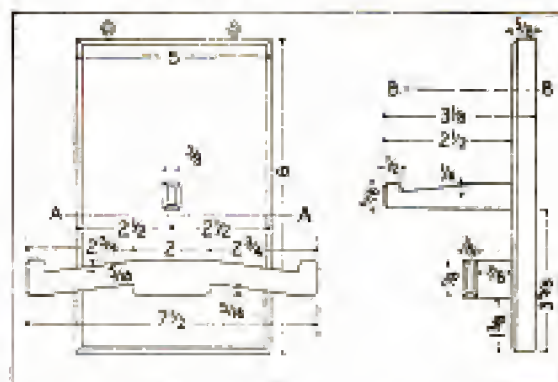
Combination Tie Rack and Collar Holder

An unusual though simple tie rack can be made by supporting the tie bar in the center. By this arrangement the ties can be placed on it from either end,

thus avoiding the tedious threading through, required on the ordinary rack supported at each end. Collars may be hung on a peg placed above the tie bar.



Collar and Tie Rack with Open-End Hangers So That the Articles can be Slipped On Easily without Being Passed behind a Bar as Is Usually the Case



The pieces can be glued together and a good finish given in the usual way. The rack can be hung up by two screw eyes. The material required consists of four pieces, dimensioned $\frac{3}{8}$ by 5 by 8 in., $\frac{3}{8}$ by $\frac{7}{8}$ by $2\frac{1}{2}$ in., $\frac{3}{8}$ by $\frac{7}{8}$ by $3\frac{1}{8}$ in., and $\frac{7}{8}$ by $\frac{7}{8}$ by 2 in. respectively.—Contributed by Arthur C. Vener, Dallas, Texas.

Skates Made of Wood

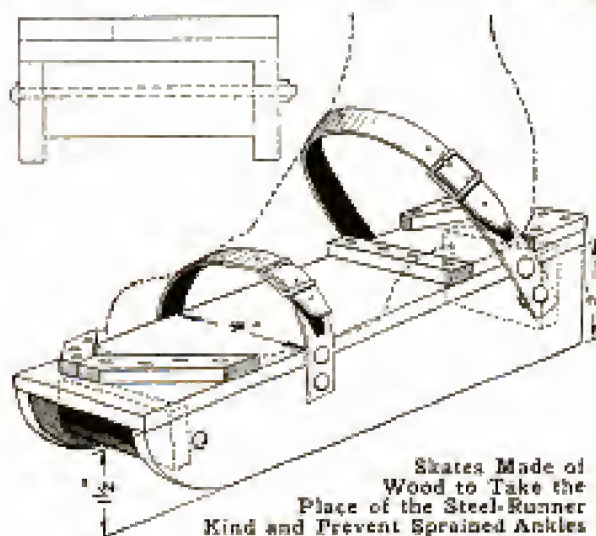
Skates that will take the place of the usual steel-runner kind and which will prevent spraining of the ankles, can be made of a few pieces of $\frac{1}{2}$ -in. hardwood boards.

Four runners are cut out, 2 in. wide at the back and $1\frac{1}{2}$ in. wide at the front, the length to be 2 in. longer than the shoe. The top edges of a pair of runners are then nailed to the under side of a board 4 in. wide, at its edges.

A piece of board, or block, 2 in. wide is fastened between the runners at the rear, and one 1 in. wide, in front. Two bolts are run through holes bored in the runners, one just back of the front board, or block, and the other in front of the rear one.

Four triangular pieces are fastened, one on each corner, so that the heel and toe of the shoe will fit between them, and, if desired, a crosspiece can

be nailed in front of the heel. Straps are attached to the sides for attaching



Skates Made of Wood to Take the Place of the Steel-Runner Kind and Prevent Sprained Ankles

the skate to the shoe. Both skates are made alike.—Contributed by F. E. Kennar, Hennessey, Okla.

ⒸThe best paint for paper roofing is asphaltum varnish.

FOUR-PASSENGER COASTING BOBSLED

By R. H. ALLEN

COASTER bobs usually have about the same form of construction, and only slight changes from the ordinary are made to satisfy the builder. The one shown has some distinctive features which make it a sled of luxury, and the builder will pride himself in the making. A list of the materials required is given on the opposite page. Any wood may be used for the sled, except for the runners, which should be made of ash.

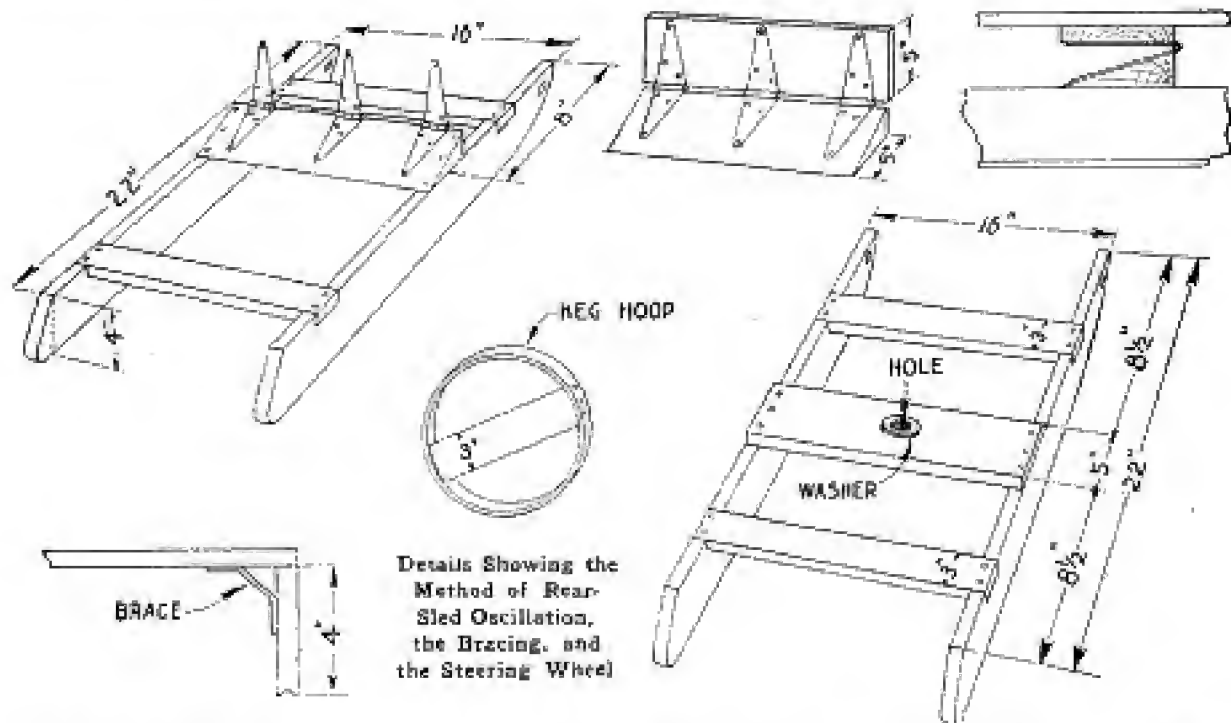
Shape the runners all alike by cutting one out and using it as a pattern to make the others. After cutting them to the proper shape, a groove is formed on the under edge to admit the curve of a $\frac{5}{8}$ -in. round iron rod about $\frac{1}{4}$ in. deep. The iron rods are then shaped to fit over the runner in the groove and extend up the back part of the runner and over the top at the front end. The extensions should be flattened so that two holes can be drilled in them for two wood screws at each end. If the builder does not have the necessary equipment for flattening these ends, a local blacksmith can do it at a nominal price. After the irons are fitted, they are fastened in place.

The top edges of the runners are notched for the crosspieces so that the top surfaces of these pieces will come flush with the upper edges of the runners. The location of these pieces is not essential, but should be near the ends of the runners, and the notches of each pair of runners should coin-

Coasting Is One of the Best Sports a Boy Enjoys during Winter, and a Sled of Luxury Is Something to Be Proud of among Others on a Hill or Toboggan Slide

side. When the notches are cut, fit in the pieces snugly, and fasten them with long, slim wood screws. Small metal

The supporting crosspiece on the front sled is fastened on top of the runners, at a place where its center



Details Showing the Method of Rear-Sled Oscillation, the Bracing, and the Steering Wheel

braces are then fastened to the runners and crosspiece on the inside, to stiffen the joint.

As the rear sled must oscillate some, means must be provided for this tilting motion while at the same time preventing sidewise turning. The construction used for this purpose is a hinged joint. The heavy 2 by 5-in. crosspiece is cut sloping on the width so that it remains 2 in. thick at one edge and tapers down to a feather edge at the opposite side. This makes a wedge-shaped piece, to which surface the three large hinges are attached. The piece is then solidly fastened to the upper edges of the runners that are to be used for the rear sled, and so located that the center of the piece will be 8 in. from the front end of the runners.

will be 11 in. from the front end of the runners.

The top board is prepared by making both ends rounding and planing the surfaces smooth. On the under side, the two crosspieces are placed, which should have two $\frac{1}{2}$ -in. holes bored through the width of each, near the ends, to receive the eyebolts. They are placed, one with its center 12 in. from the end to be used for the rear, and the other with its center 8 in. from the front end, and securely fastened with screws. The shore is placed in the center of the board, and wires are run over it connecting the eyebolts. The eyebolts are then drawn up tightly to make the wire taut over the shore. This will prevent the long board from sagging.

On the upper side of the board and

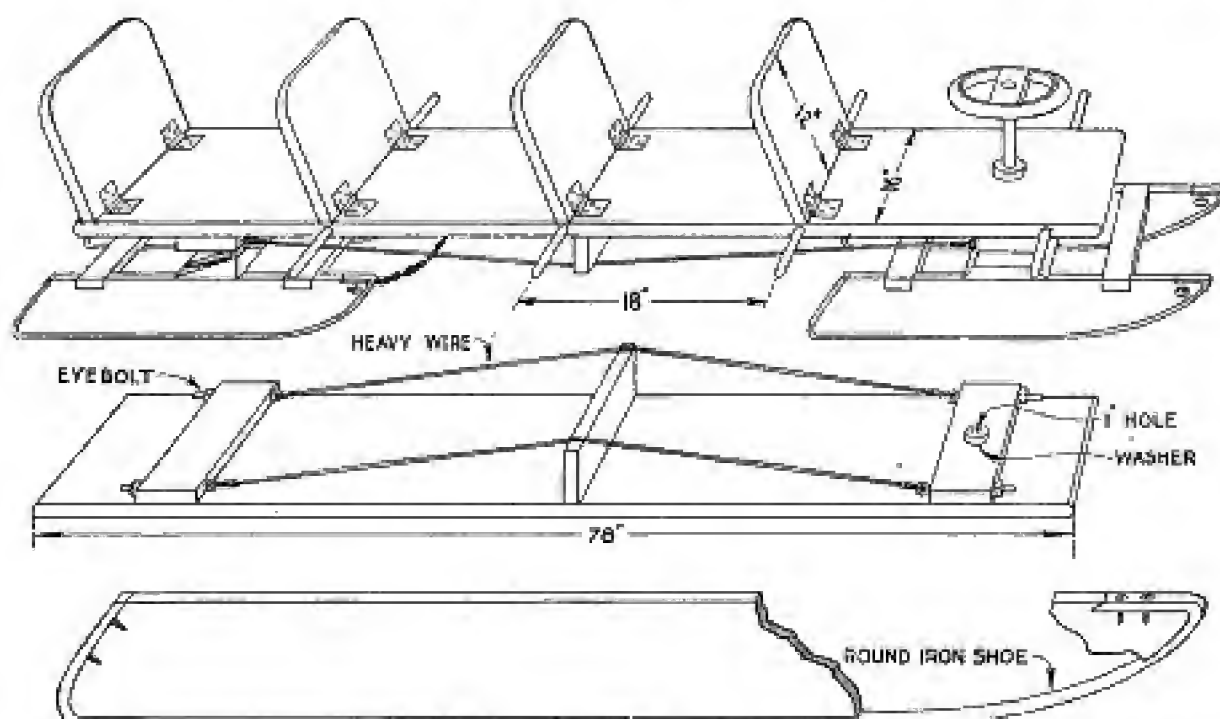
LIST OF MATERIALS

1 top, 6½ ft. long, 16 in. wide, and 1¾ in. thick.
4 runners, 22 in. long, 4 in. wide, and 1 in. thick.
4 crosspieces, 16 in. long, 3 in. wide, and 1 in. thick.
3 pieces, 16 in. long, 5 in. wide, and 2 in. thick.
1 piece, 16 in. long, 5 in. wide, and 1 in. thick.
1 shore, 16 in. long, 3 in. wide, and 1 in. thick.

4 seat backs, 12 in. long, 16 in. wide, and 1 in. thick.
1 dowel, 3 ft. long, and 1 in. in diameter.
4 rods, ¾ in. in diameter, and 30 in. long.
4 eyebolts, ¾ in. by 6 in. long.
3 hinges, 5-in. strap.
8 hinges, 3-in. strap.

beginning at the rear end, the backs are fastened at intervals of 18 in. They are first prepared by rounding the cor-

keg hoop. A piece of wood is fastened across its diameter, and the hoop is covered with a piece of garden hose



The Top Board is Well Braced on the Under Side and Fitted with Four Backs on Top to Make It a Luxurious Riding Sled, and the Runners are Provided with Metal Shoes for Speed

ners on the ends used for the tops, and the opposite ends are cut slightly on an angle to give the back a slant. They are then fastened with the small hinges to the top board. On the edges of the top board, 1-in. holes are bored about 1 in. deep, and pins driven for foot rests. These are located 18 in. apart, beginning about 5 in. from the front end. The dowel is used for the pins, which are made 4 in. long.

The steering device consists of a broom handle, cut to 18 in. in length, with one end fastened in a hole bored centrally in the 5-in. crosspiece of the front sled. A hole is bored in the top board through the center of the crosspiece fastened to the under side for the steering post. The broomstick is run through this hole after first placing two metal washers on it. After running the stick through, a hardwood collar is fastened to it just above the top board, so that the top cannot be raised away from the sled. At the upper end of the broomstick a steering wheel is attached, made from a nail-

and wrapped with twine. In the center of the crosspiece, a hole is bored to snugly fit on the broom handle, which is then fastened with screws.

The rear sled is fastened to the top board with screws through the extending wings of the hinges and into the crosspiece. Holes are bored in the front ends of all runners, and a chain or rope is attached in them, the loop end of the rear one being attached to the under side of the top board, and the one in the front used for drawing the sled.

To Prevent Drill from Catching As It Passes through Metal

The regular slope of a drill will cause the cutting edge to catch as it breaks through the metal on the opposite side of the piece being drilled. But if a twist drill is ground more flat like a flat drill, it will not "grab" into the metal as it passes through.—Contributed by James H. Beebee, Rochester, N. Y.

Preventing Window Sash from Freezing to the Sill

When it is cold enough to cause the window sash to freeze fast in the bath-room and bedrooms not having double sash, much discomfort will be experienced and the health may even be menaced. I have discovered a simple method to overcome this difficulty. Lay on the outside sill, close up against the window frame, a thin, narrow strip of wood, on which the window can rest when down. This gives a continual current of fresh air between the sashes at the center, but no unpleasant draft below, and no amount of dripping and freezing will fasten the window sash upon it.—Contributed by Mary Murry, Amherst, Nova Scotia.

A Hanger for the Camp

A garment, or utensil, hanger can be easily made for the camp in the following manner: Procure a long



strap, about $1\frac{1}{4}$ in. wide, and attach hooks made of wire to it. Each hook

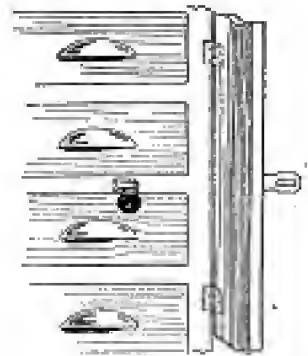
should be about 4 in. long and of about No. 9 gauge wire. Bend a ring on one end of the wire and stick the other end through a hole

punched in the center of the belt. The ring will prevent the wire from passing through the leather, and it should be bent in such a manner that the hook end of the wire will hang downward when the width of the belt is vertical. These hooks are placed about 2 in. apart for the length of the belt, allowing sufficient ends for a buckle and holes. The strap can be buckled around a tree or tent pole.—Contributed by W. C. Loy, Rochester, Ind.

⚠Never stand in a direct line of a swiftly revolving object, such as an emery wheel.

Locking Several Drawers with One Lock

A lock for a number of drawers in a bench or cabinet may be applied with a strip of wood hinged to the cabinet edge so that it will overlap the drawer fronts, as shown. A hasp and staple complete the arrangement for use with a padlock.—Contributed by H. W. Hahn, Chicago.

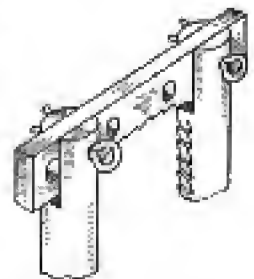


A Lightning-Calculation Trick

By means of a simple arrangement of numbers, a calculation can be made which will easily puzzle any unsuspecting person. If the two numbers 41,096 and 83 be written out in multiplication form, very few will endeavor to write down the answer directly without first going through the regular work. By placing the 3 in front of the 4 and the 8 back of the 6, the answer is obtained at once, thus: $41,096 \times 83 = 3,410,968$. A larger number which can be treated in the same way is the following: $4,109,589,041,096 \times 83 = 341,095,890,410,968$.

An Adjustable Nutcracker

The advantage of the nutcracker shown in the illustration is that it can be adjusted to various-sized nuts. The handles are similar to those usually found on nutcrackers except that they are slotted at the cracking end to receive a special bar. This bar is 2 in. long, $\frac{1}{2}$ in. wide, and $\frac{1}{8}$ in. thick, with $\frac{1}{8}$ -in. holes drilled in it at intervals to allow for adjustment. Cotter pins are used in the holes as pins.



Electrical Heating Apparatus for the Home

By ARTHUR MOORE

PART XI—An Electric Oven

THE electrically heated oven, illustrated and described herewith, consists of a sheet-iron box, 18 in. by 18 in. by 12 in., placed inside a second, larger sheet-iron box, the space between the two boxes being filled with asbestos or other good insulator. The heating element described is constructed to operate on a 110-volt circuit.

Procure several pieces of good sheet iron, about the same weight as that used in stove pipes or the ovens on gas ranges, of such a size that parts with dimensions given in Figs. 1, 2, 3, 4, and 5 may be cut from them. The piece shown in Fig. 1 is to form the top, bottom and ends of the inner box. Bend the portion of the piece above the dotted line A back under the main portion of the sheet, then bend the upper edge down at right angles along the dotted line B. The upper edge of the sheet is cut at the points marked C, D, E, and F. In bending the edges, as indicated above and in other cases which will follow as the work progresses, it would be best to have a tinner do the

K. The lines H and J make angles of 45 deg. with the vertical. Bend the lower edges of the right and left ends over twice along the dotted lines, in the same manner as the upper edge, except that the first bend along the lower edge should be up instead of down. A cross section through LM is shown which will give a much clearer idea of the way these edges should be bent than the description. Bend the center projecting piece N down at right angles to the main portion of the sheet along the dotted line. The ends of the piece N are bent up on top of the piece along the dotted lines at the ends. Bend the two ends of the main piece up along the dotted lines O and P and then the vertical portions over at right angles so that the two ends of the sheet overlap. These two ends are now joined by means of a seam so that the length of this side will be exactly the same as the length of the lower side, or 18 in. This seam should be hammered down tightly, and it might be well to place several small rivets through it.

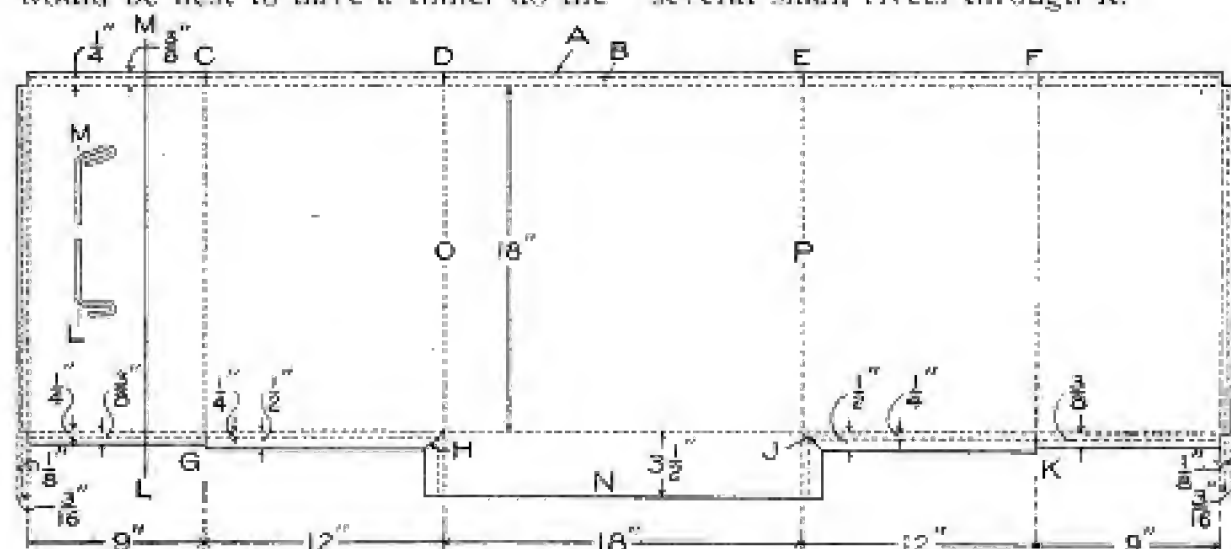


FIG. 1
Dimensions of the Piece of Sheet Metal with Cuts and Lines Showing Where the Bends are Made That will Form a Box for the Inner Part of the Oven

work on machines made for that purpose. Cut the lower edge of the sheet to the dimensions given, and then cut the edge at four different places, as shown by the full lines at G, H, J, and

The back of the box is made from a piece of sheet iron as shown in Fig. 2. After the piece has been cut to the proper dimensions, bend all four edges up along the four outer dotted lines

and then make a second bend in each edge along the inside dotted lines. The second bend is up, or in the same direction as the first one. To fasten the back in position, proceed as follows: First hammer down the double thickness of the edges along the top and bottom portions of the rectangle formed from the piece shown in Fig. 1. Engage the edges of the back and side of the rectangle, as shown at Q, Fig. 2, and slide the back down until it is in the proper position. The lower edge of the piece must not be bent up the second time until after the foregoing operation is performed. When the piece is in position the lower edge of the back can be bent over on top of the projection on the bottom of the rectangle. The upper and lower edges of the back and rectangle cannot be locked together as the sides were, and for this reason a number of small rivets are placed through the seams after they have been hammered down perfectly flat. Before attaching the outer box two pieces of metal formed into a right angle are riveted to each of the ends at 2 and 6 in. from the bottom, respectively. An open rack is used on

given in Fig. 3. The upper edge of this piece is first bent up along the dotted line on top of the main part of the

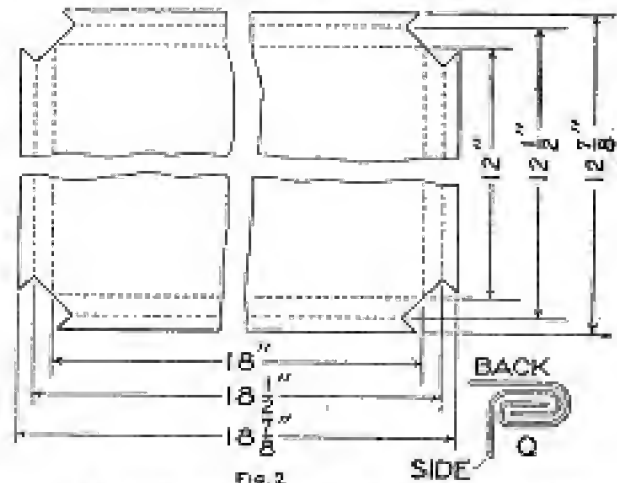


FIG. 2
The Shape of the Piece to Form the Back, and Manner of Joining the Edges

piece. A second bend is then made along the next dotted lines, bending the edge under the main portion of the piece. The lower edge is bent under on the lower dotted line and up against the main portion of the piece. A second bend is made along the upper dotted line, bending the lower portion down at right angles to the upper portion. Bend the two ends down along

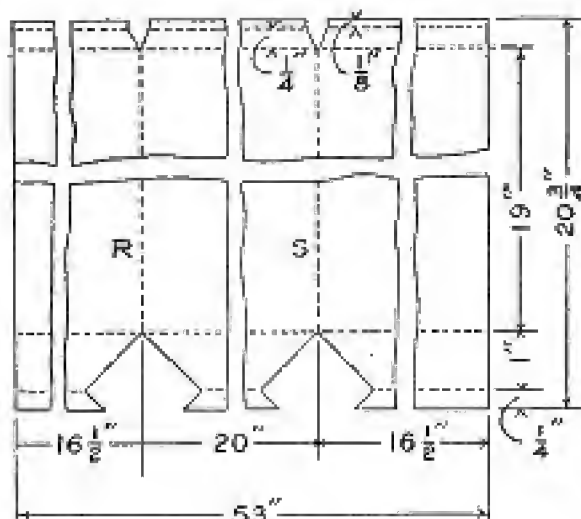


FIG. 3

Dimensions of the Pieces, Together with Lines Showing the Bends, to Form the Outside Covering for the Oven; Also the Shape of the Back with Cross Section of the Joints at the Edges

these projecting pieces to raise the object being heated from the heating element.

The dimensions of the piece forming the top and ends of the outer box are

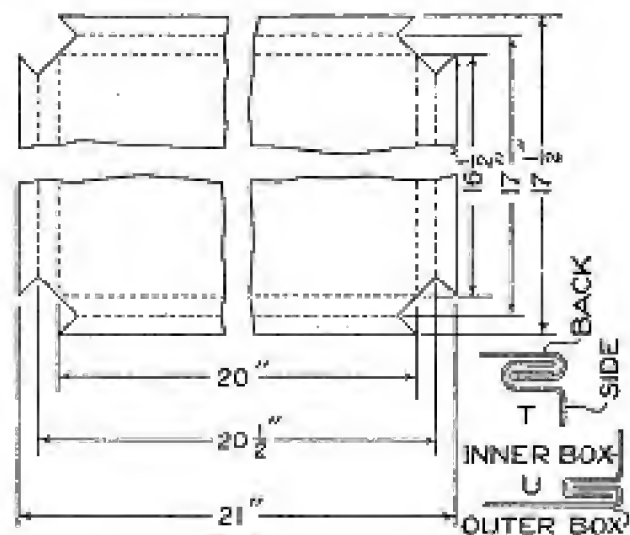


FIG. 4

the dotted lines R and S until they are at right angles to the center portion.

The dimensions of the piece forming the back of the outer box are given in Fig. 4. The edges outside of the outer

dotted lines are bent over the top of the main portion of the piece and hammered down along the bend. Make a

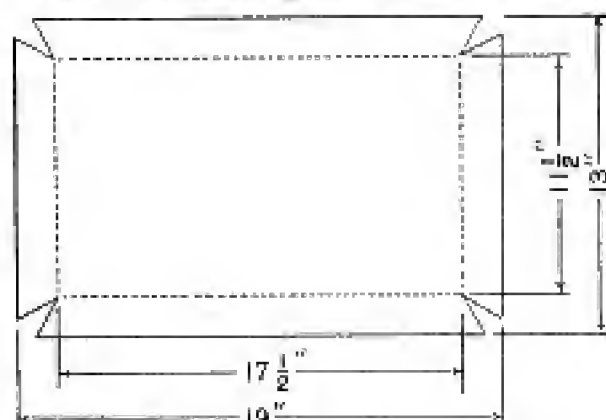


FIG. 5

The Door Piece is So Shaped That It will Receive a Back to Make a Space for Asbestos Wool

second bend along the inner dotted lines, bringing the edges over the top of the main piece. This double edge will add strength to the box. This piece is to be fastened to the sides and top of the outer box, as shown at T, but cannot be placed in position until the fronts of the inner and outer boxes have been fastened together. A cross section of the joint between the outer and inner boxes is shown at U. These joints should be hammered down well, and fastened with small rivets having their heads battered down, as nearly flat as possible.

The door of the oven is double with the intervening space filled with asbestos. The dimensions of the piece forming the outer part of the door are given in Fig. 5. The edges are bent down along the dotted lines until the gaps at the corners are closed. A second rectangular piece just a little larger than the over-all dimensions of the outer piece should have its edges bent up and over the edges of the outer piece. Two small metal hinges should be attached to the lower edge of the completed door, and then in turn fastened to the front of the oven, so that the opening for the door is properly covered.

Before fastening the inner box in place, two handles are attached to the ends of the outer one. A good method of making these handles is shown in Fig. 6. The portion V, below the

dotted line, is bent over a round bar to form the grip. They are fastened on the box with round-head stove bolts, with the nuts inside. It would be advisable to cut the ends of the bolts off close to the nuts, and hammer the ends down like rivets to prevent them coming loose after the oven is completed, as it will be impossible to replace them.

Fill the space between the inner and outer boxes at the top and ends with asbestos wool. If the metal used in making the boxes is so light that the walls spring apart or tend to separate when the asbestos is packed in place, a number of metal pieces should be made to be used in holding the walls in their proper relation to each other. The space between the inner and outer boxes, depending on the dimensions, will be approximately 1 in. After the asbestos has been packed in the ends and top outside of the inner box, the back of the outer box may be placed in position and the seams riveted. Then fill the space between the backs of the boxes with asbestos. Considerable care should be exercised in packing the walls, to make sure they are filled throughout uniformly, but not too tightly, as nothing is gained by pounding it in. If the instructions have been carried out carefully, there should be a compartment beneath the inner box, $3\frac{1}{2}$ in. deep, 20 in. long and 20 in. wide, in which to place the heating element.

The heating element consists of two circuits of different resistances so ar-

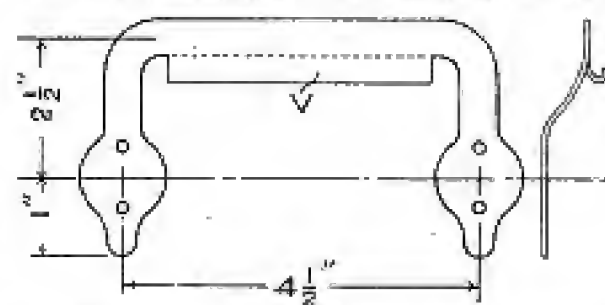


FIG. 6

The Handles are Made of Sheet Metal and Attached to the Oven with Stove Bolts

ranged that they can be connected to the electrical circuit either singly or at the same time, thus giving three dif-

ferent degrees of heat, which is often quite desirable. The construction of the heating element is as follows: Obtain two pieces of heavy mica, 1 in. wide and $18\frac{1}{2}$ in. long. Drill a number of $\frac{1}{8}$ -in. holes along the edge of each of these, $\frac{1}{4}$ in. apart and $\frac{1}{4}$ in. from the edge. Back of every alternate hole drill a second $\frac{1}{8}$ -in. hole, measuring $\frac{1}{2}$ in. from the edge. Along the other edge of the pieces drill five $\frac{1}{8}$ -in. holes, equally spaced, the end holes being 1 in. from the ends and all the holes $\frac{3}{8}$ in. from the edge. Next form 10 right-angled pieces from some sheet iron, and fasten them to the pieces of mica with small bolts; the other surface is fastened to the ends of the outer box on the inside of the compartment for the heating element, so that the lower surfaces of the pieces of mica will be about $\frac{1}{4}$ in. above the bottom of the inner box when the oven is upside down. Obtain two more pieces of mica, $\frac{1}{2}$ in. wide and 19 in. long, and drill $\frac{1}{8}$ -in. holes through these, $\frac{1}{4}$ in. apart. Mount these pieces on edge, on top of the bottom of the inner box, by means of right-angled pieces attached to the ends of the mica and outer box. The bottom of the inner box should be covered with some thin sheet mica so as to insulate the heating element.

Procure 50 ft. of No. 14, and 50 ft. of No. 16 gauge nichrome resistance wire. Start with the end of one of these pieces and anchor it in one of the $\frac{1}{8}$ -in. holes shown in Fig. 7, then pass through the end holes in the center

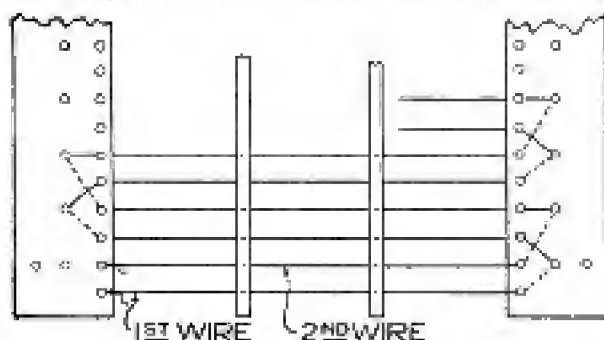


FIG. 7

Pieces of Mica are Used to Provide a Means of Holding the Wire for the Heating Element

pieces of mica and to the end hole in the piece of mica on the opposite side, then, as shown, to the third hole and

back to the starting side. The second wire starts from the second hole and fills up the remaining holes after the

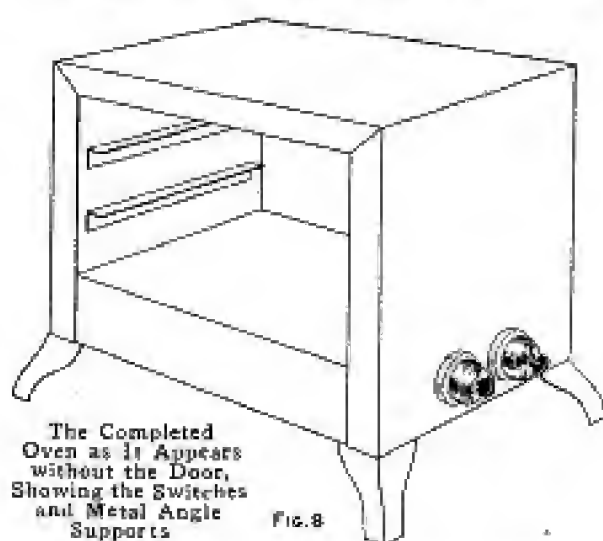


FIG. 8

first wire has been put in position. After both wires are in place, several narrow strips of thin mica are woven crosswise between them, so as to prevent them coming in contact with each other.

Two double-pole snap switches are mounted on one end of the oven near the lower edge, and the terminals of the two heating wires connected to them by means of asbestos-insulated leads. Two terminals of each switch should be connected to the line, which may be brought into the compartment by means of heavy asbestos-insulated lamp cord, passing through a properly bushed hole in the bottom of the heating compartment. After these connections are all made, the heating element should be covered with a thin sheet of asbestos, and the remaining space filled with asbestos wool. The bottom of the outer box should be formed from a piece of sheet iron, 20 in. square, by cutting a $\frac{1}{2}$ -in. square from each corner and bending the edges over at right angles so that they extend $\frac{1}{2}$ in. above the main piece. This piece can be held in position with a number of bolts which pass through the projecting edges and the lower edge of the box. A view of the completed oven is shown in Fig. 8. The legs and latch can be made in any manner to suit the builder.

INTERESTING NEW PATENTS

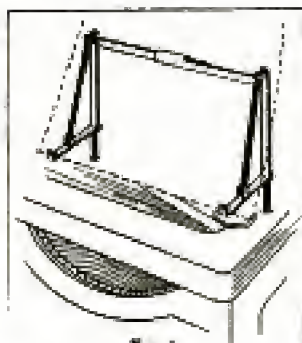


Fig. 1

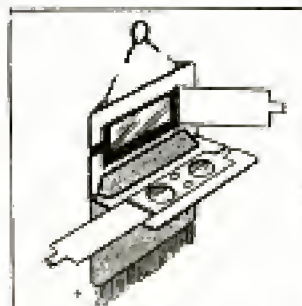


Fig. 2

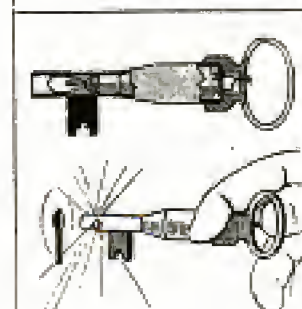


Fig. 3

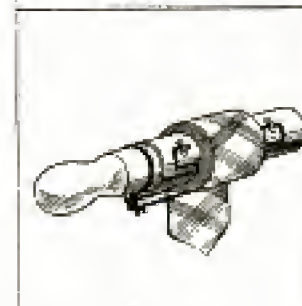
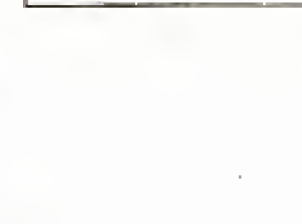


Fig. 4



Fig. 5



COPY HOLDER FOR TYPEWRITER (Fig. 1)—This copy holder is designed to be mounted on the front of the typewriter frame in convenient range of the eye. The cross bar is made in sections, and all parts are pivoted together so that the holder is easily folded for transport when detached from the machine.

FOLDING CHAIR FOR SEWING MACHINE (Fig. 2)—The idea of this invention is to furnish a seat that can be folded and swung under the machine, and out of the way when not in use. The legs, seat, and back are so connected by levers that when the legs are drawn together the back folds down on the seat. The front legs are pivoted to the base of the machine, and when folded in this way the entire seat is easily swung under the machine.

COMBINED VANITY CASE AND HAND BAG (Fig. 3)—One jaw of the hand bag carries a mirror, and the other carries receptacles for cosmetics. The mirror is protected by a hinged metallic flap that is held in place, when closed, by a spring snap, while the two receptacles for cosmetics consist of depressions in a metallic frame, and are closed by a hinged cover.

AUTOMOBILE SPRING (Fig. 4)—The purpose of this device is to relieve the car body of road shocks, and to equalize the strain in the springs. The essential feature is the equalizer connecting the leaf springs of the axle with the separated spiral springs curving down from the body. This is supported at the end of the leaf spring by a link and is connected at each end with the spiral springs, as shown.

KEY THAT ILLUMINATES KEYHOLE (Fig. 5) (Belush patent to a German)—In a recess in the end of the key is a small electric-light bulb that furnishes enough illumination to enable the user to find the keyhole. Current is supplied by a small battery placed in the body of the key, and the light is turned on by pressure on a button in the handle.

BOWLING BALL WITH DISAPPEARING HANDLE (Fig. 6)—This handle is designed to take the place of the usual holes for giving the player a grip on the ball. The base of the handle slides on a pin inside the ball and its outer surface is normally held flush with the surface of the ball by a spring. In using, the fingers are thrust under the handle through side recesses and the handle is pulled out against the action of the spring. The instant it is released the handle is snapped back into closed position by the spring.

NECKTIE ROLL (Fig. 7)—This device consists simply of a roll for winding the necktie tightly. The roll is carried on a handle with which it may be locked to prevent rotation. There is a spring clip for attaching the end of the necktie to the roll, and another clip for holding the outer end of the necktie after it has been wound.

PEN FOR APPLYING PLASTIC MATERIALS (Fig. 8)—The plastic material is placed in the bulb to which the pen barrel is attached, the screw top of the bulb being easily removed for this purpose when required. The writer simply takes the pen in one hand and presses the attached air bulb with the other, and the air compresses the material and causes it to flow from the pen point.

MEASURING SPOUT FOR SUGAR BOWL (Fig. 9)—The essential feature of this device is the hinged cover for the spout. This is provided with a recess into which the sugar flows when the bowl is tipped, and has a flange that projects downward and stops the flow from the body of the bowl when the cover is swung open.

DEVICE FOR HOLDING OVERSHOE IN PLACE (Fig. 10)—The wire ring is so made that it slips over the heel of the overshoe, as shown. At the sides of the ring are loops to which straps are attached and passed up around the counter and instep.

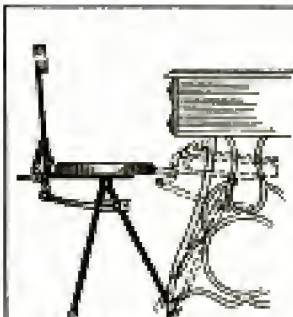


Fig. 7

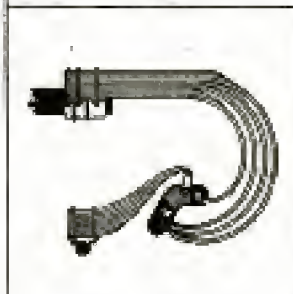


Fig. 8

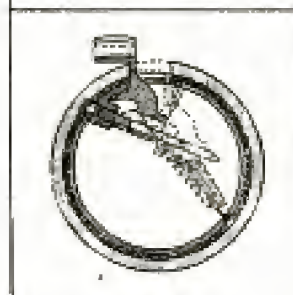


Fig. 9



Fig. 10



Fig. 11

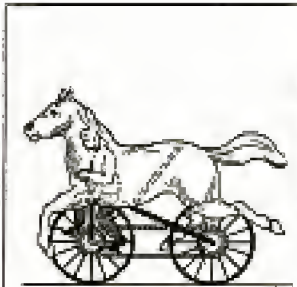


FIG. 11

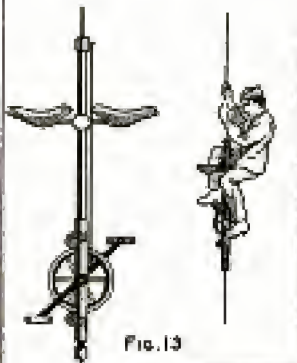


FIG. 13



FIG. 15



FIG. 17



FIG. 19

COMBINED VELOCIPEDE AND HOBBY-HORSE (Fig. 11)—The rider sits within the body of the horse, which is made hollow, while openings in the neck of the horse provide the rider with a view ahead. The legs of the horse are pivoted to the body and are moved back and forth by the wheels in imitation of the movements of a real horse.

FRUIT CATCHER (Fig. 12)—This device consists simply of a cloth apron placed around the tree and supported by collar and stakes, as shown, and is designed for catching the fruit as it is thrown or shaken from the tree. The apron is made in one piece, but has a radial slit running from the center to the edge, which makes it possible to place the apron in position around the tree. The fruit is taken out of the apron through a spout.

FOOT-OPERATED ELEVATOR (Fig. 13)—This curious device is apparently intended for the convenience of workmen in building and other construction. The whole device is raised or lowered, as the wheel is rotated by the pedals, by a rope that passes down inside the tubular shaft and around the wheel. It may be held in any fixed position by a pawl that acts on a ratchet on the wheel.

SPRING WHEEL FOR AUTOMOBILE (Fig. 14)—The particular feature about this spring wheel is the series of strong and closely spaced S-shaped springs that connect the inner portion of the wheel with the rim. These not only furnish the necessary resiliency but are evidently designed for giving the wheel strength and rigidity in the line of the thrust produced by the engine.

COUNTERWEIGHT FOR SAILBOAT (Fig. 15; Swedish patent)—The object of this curious device is to keep the boat from heeling over in any wind. Both the mast and the stem of the counterweight are pivoted to the boat, and are connected by cables running through sheaves so that they swing simultaneously in opposite directions. As the mast bends under the wind the counterweight swings out to the opposite side and balances the boat.

EYE SHADE WITH HOLDING ATTACHMENTS (Fig. 16)—The purpose of this invention is to provide an eye shade that will stay in one position without attention from the wearer. The different parts are adjustable, as shown, so that the shade is easily fitted to a comfortable shape and position.

HAMMER WITH DIAGONAL NAIL CLAW (Fig. 17; American patent to a Canadian)—The slot is cut diagonally and terminates in the side of the head. This leaves the full width of the hammer head available for a cutting edge.

GAUGE FOR GASOLINE TANK (Fig. 18)—The stem of the float is pivoted to the bottom of a standard that projects downward from the gauge case, and the float is therefore free to swing in an arc as the surface of the liquid rises and falls. An arm fixed to the lower end of the float stem engages a lever, on the opposite end of which the gauge indicator is carried. As the surface of the liquid rises or falls the indicator is correspondingly raised or lowered.

CORN SPOON (Fig. 19)—This spoon is designed for cutting the corn from the cob. The bowl is tubular in shape with a diameter slightly greater than the width of a grain of corn, is provided with a notched cutting edge at the end, and is evidently intended for cutting off one row of grains at a time.

DRIP CUP FOR UMBRELLA (Fig. 20)—This cup is fixed with clamps to the top of the umbrella stick. It is so shaped that it does not interfere with the opening of the umbrella and is always in place to catch the drip when the wet umbrella is closed and set down in the usual way. It is easily unclamped from the stick when necessary for emptying.

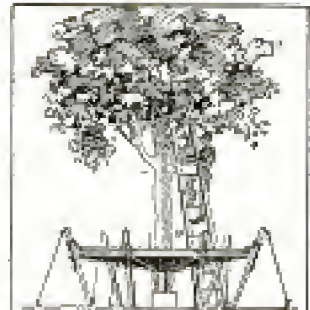


FIG. 12

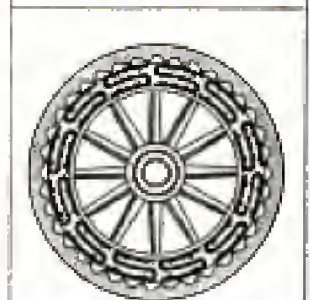


FIG. 14



FIG. 16



FIG. 18



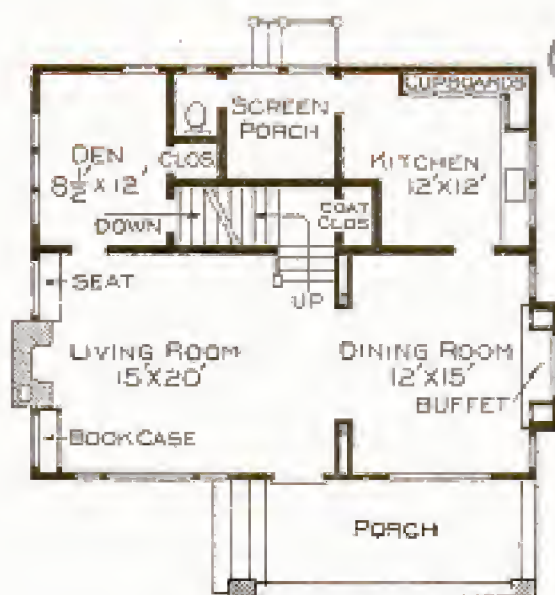
FIG. 20

FRAME BUILDING WITH CONCRETE FOUNDATIONS

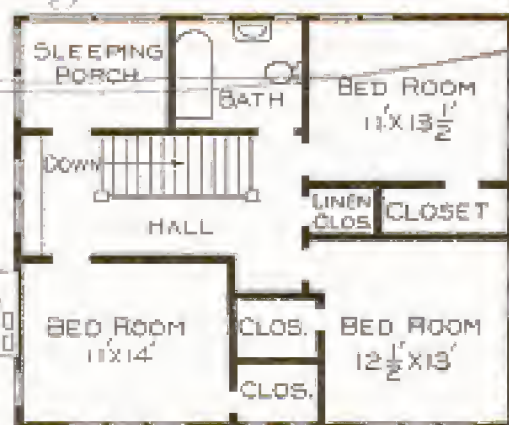


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First-Floor Plan



Second-Floor Plan

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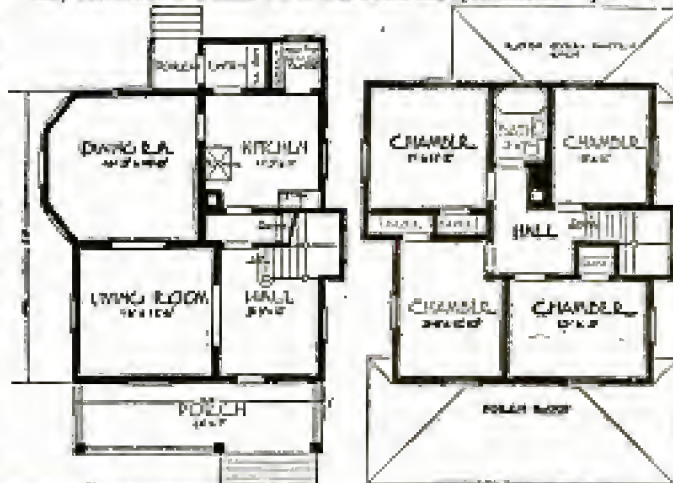


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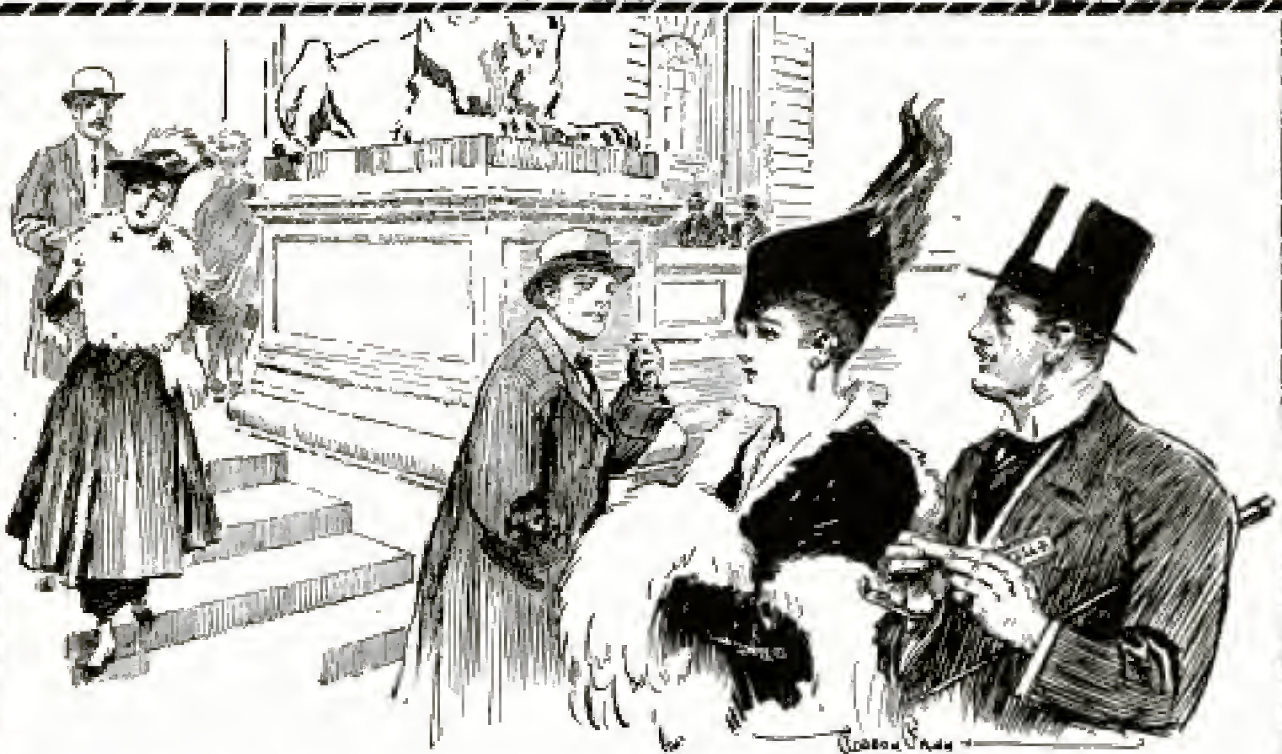
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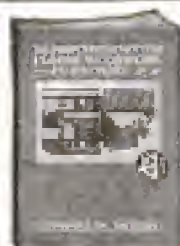
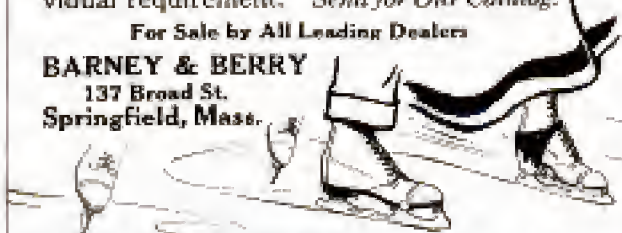
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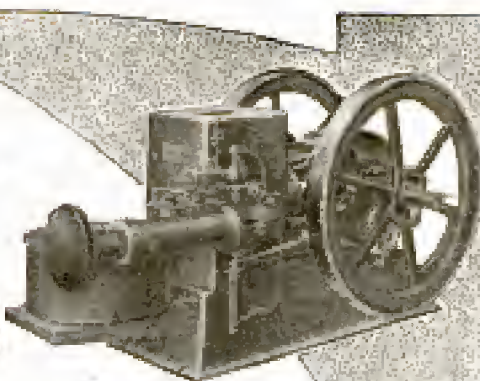
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Sold only Direct from my Factory Doors to the User's Hands!

No matter what kind of work nor how much of it there is to be done there is a WITTE Engine, stationary, portable, skidded, or special saw rig, of just the size and style that is best suited for that particular work.

Whatever size or style you select, it is guaranteed to stand up under years of hard wear and deliver steady power for the lowest fuel cost. So simple in construction that you can easily understand, start and run it, whether you are experienced with an engine or not.

Get My Complete New Offer and Copy of My New Book FREE

You should have a copy of my new Book — **HOW TO JUDGE ENGINES**. Explains how to start and keep an engine running—how little it costs, and how easy it is, under

my liberal easy terms and sales plan, for any WITTE engine to earn its own cost while it is being paid for. Mail coupon today and I will send you the whole WITTE story by return mail.

ED. H. WITTE
WITTE IRON WORKS CO.
1746 Oakland Avenue
Kansas City, Mo.

WITTE Kerosene Engine—Stationary Burns Kerosene, Distillate, Solar Oil, Turpentine and all fuels of like grades. Also Gasoline, Naphtha and Gas.

Latest WITTE Engine Prices:

(On account of war conditions, subject to change without notice.)

2 H-P	\$34.95
4 H-P	60.75
6 H-P	97.75
8 H-P	139.65
12 H-P	219.90
16 H-P	298.80
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Portable and Saw-rig Outfits proportionally low

WITTE prices make you a good profit right on the first cost and give you the satisfaction and protection of dealing direct with the maker. I give a liberal **5-Year Guaranty** on the efficiency and durability of every engine I ship.



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With no obligation on my part I should like to receive your latest and finest Engine Book, with your new liberal Selling Plan.

Name

Address

Please Mention Popular Mechanics

300 Candle Power of Light AT A COST OF 1/8c PER HOUR

The Kerosene table lamp has one inverted mantle and **MAKES AND BURNS ITS OWN GAS FROM COMMON KEROSENE OR COAL OIL.** It gives a bright and steady white light **TEN TIMES** as **BRILLIANT** as an ordinary kerosene wick lamp.

The "Quicklit" Gasoline table lamp can be **LIT WITH AN ORDINARY MATCH LIKE CITY GAS.**

Both styles equipped with automatic cleaning needle.

No smoke, no smell, no wicks to trim. A splendid proposition for dealers

LIVE AGENTS WANTED

Write today for further particulars, also complete illustrated catalog describing the above kerosene and gasoline lamps and hollow wire systems.

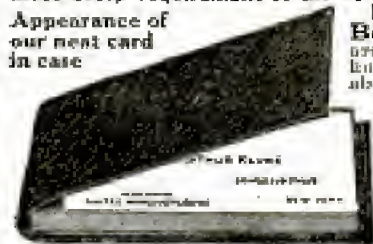
THE NAGEL-CHASE MFG. CO., 144-164 East Erie St., CHICAGO, ILL., U.S.A.

The largest manufacturers of artificial lighting devices in the world.

Proper Business Card Equipment

can be provided in only one way, if the best results are to be secured from the use of a business card. **No other card will meet every requirement of the up-to-date business man.**

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is the best card that human ingenuity has been able to produce. They have no competitor, no rival. There are none other "just as good." Carried in an elegant seal leather case, in book form, they are detached and used by one as their own demands. They are strong, clear, the edges are absolutely smooth—there is no indication of detachment—and they are unmarred and attractive. Send for a sample today and detach them now by one. You cannot appreciate their uniqueness except by an examination. **SEND TODAY.**

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Engravers, Die Embossers, Plate Printers

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One Year To Pay**



\$35 NOW Buys "Chicago"

visible typewriter, guaranteed 10 years. This wonderful machine will do anything that any hundred dollar machine will do and more—Does beautiful, even work. Always impossible to get out of order. You save \$25 by buying direct from the factory. For only \$2 down we will send typewriter on approval for

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If satisfied you can pay the balance at the rate of only \$2 a month until machine is paid for. If not pleased at end of 10 days, just return the outfit at our expense and every penny you paid us will be refunded. You take no risk.

FREE!—Leatherette Carrying Case

with bones looks and trimmings will be sent to those who order promptly.

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Grows eggs to buy our Kettle-Topped Popcorn—topped under glass—served while popping—GREAT BIG—GIRL—PLUMP YERKES. Corn uses 25 per cent bigger with the Dellenbarger machine and 100 per cent better product. Our delicious CRISPETTE melt in your mouth. Wonderful new Automatic Crispette Press is a regular money-maker! Big extra money in candy!

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Red or Black "Vulcan" Ink Pencils



The ONLY perfect, non-leakable ink pencil at moderate prices.

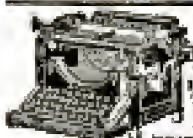
\$1.00 post-paid

TWO SIZES.
4½ and 5½ inches
Extra Size, 8 inches
(Black Only), \$1.25.
Liberal supply of ink free with retail order.

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WRITE 600 WORDS WITH ONE DIP

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Mostly sold by recommendation. For Personal Bank or General Office.

It checks mental calculations, handles all business calculations. Buy Thru Your Stationer. Write for today trial offer.

E. Baughner, A. A. N. Co., 115 W. Broadway, New York City.

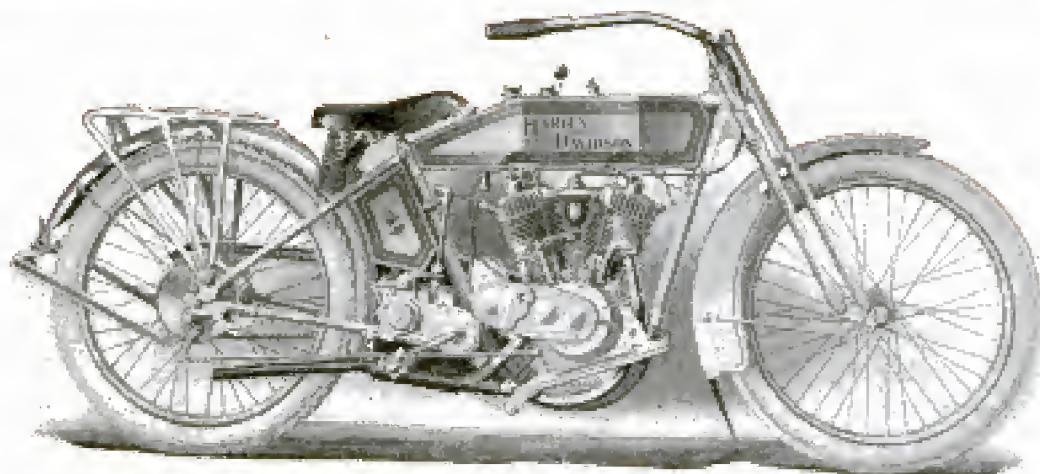
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Golden Gem \$10 Adding Machine

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Multiples—Subtracts



Model 11-F. 11 H. P. Three-Speed Twin Cylinder with Step-Starter, \$275.00

Why Harley-Davidson Factories Are Working Night and Day

SINCE the 1915 Harley-Davidson announcement in October the Harley-Davidson factories have been running day and night to take care of the demand for the 1915 three-speed twin. The 1915 Harley-Davidson is the first motorcycle to carry a definite guarantee of horsepower. Rated at 11 horsepower, every 1915 Harley-Davidson twin which has left the factory has developed well in excess of that rating.

By winning the National F. A. M. championship, the 1915 Harley-Davidson proved the claim in our announcement that it was the fastest stock motorcycle ever built.

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speed but the reliability and endurance necessary to make it stand up under the most strenuous road service. Another large addition to the main Harley-Davidson factory will enable us to add more dealers for 1915.

If, as a dealer, you are situated in a locality where we have no representative, and feel qualified to represent the Harley-Davidson in keeping with the Harley-Davidson name and reputation, get in touch with us at once.

Seven Models, \$200 and up. 1915 Catalog on request.

HARLEY-DAVIDSON MOTOR COMPANY

Producers of High-Grade Motorcycles for Nearly Fourteen Years

406 B Street, MILWAUKEE, WIS., U. S. A.

Please Mention Popular Mechanics

New KEROSENE LIGHT BEATS ELECTRIC OR GASOLINE

10 Days FREE—Send No Money



TWICE THE LIGHT ON HALF THE OIL

We don't ask you to pay us a cent until you have used this wonderful modern light in your own home ten days; then you may return it at our expense if not perfectly satisfied. You can't possibly lose a cent. We want to prove to you that it makes an ordinary oil lamp look like a candle; beats electric, gasoline or acetylene. Lights and is put out like old oil lamp. Tests at 14 leading Universities show that it

Burns 50 Hours on One Gallon common coal oil (kerosene), no odor, smoke or noise, simple, clean, won't explode. Three million people already enjoying this powerful, white, steady light, nearest to sunlight. Guaranteed.

\$1,000.00 REWARD

will be given to the person who shows us an oil lamp equal to the new Aladdin in every way (details of offer given in our circular). Would we dare make such a challenge if there were the slightest doubt as to the merits of the Aladdin? **GET ONE FREE.** We want one user in each locality in whom we can refer customers. To that person we have a special introductory offer to make, under which one lamp is given free. Write quick for our 10-Day Absolutely Free Trial Proposition and learn how to get one FREE.

MANTLE LAMP COMPANY, 374 Aladdin Building, Chicago, Ill.
Largest Manufacturers and Distributors of Kerosene Mantle Lamps in the World

Men with Rigs Make \$100 to \$300 Per Mo. Delivering

the ALADDIN on our easy plan. No previous experience necessary. Practically every farm home and small town home will buy after trying. One farmer who had never sold anything in his life before writes: "I sold 51 lamps the first seven days." Another says: "I disposed of 24 lamps out of 25 rigs." Thousands who are making money endorse the Aladdin just as strongly.

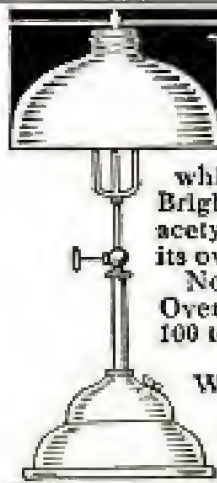
No Money Required. We furnish capital to reliable men to get started. Ask for our distributor's plan, and learn how to make big money in unoccupied territory.



KEROSENE AND GASOLINE LANTERNS

Absolutely bug and wind proof and give 300 candle power of light, at a cost of $\frac{1}{10}$ ¢ per hour. Suitable for use on farms, watchmen, side shows, circuses, street carnivals, garages, livery barns, summer resorts, warehouses, boat landings, etc.

For complete catalog and agency proposition address
THE NAGEL-CHASE MFG. CO.
180 East Erie St. CHICAGO



The "BEST" LIGHT

A soft, luminous light, which casts no shadow. Brighter than electricity or acetylene. Makes and burns its own gas. Costs 2¢ a week. No dirt, smoke nor odor. Over 200 styles, ranging from 100 to 2000 candle power.

Absolutely guaranteed. Write for illustrated catalog.

AGENTS WANTED EVERYWHERE
THE BEST LIGHT CO.
324 E. 5th St., Canton, O.

WHITE FLAME

BURNERS make your old kerosene lamps and lanterns give a brilliant white light better than electricity or gas. Doubles your light. Saves oil. **NO MANTLE TO BREAK.** Guaranteed Safe and Reliable. Delights every user. Send now for complete sample postal 35 cts., stamps or coin. **\$100.00 MONEY BACK IF NOT SATISFACTORY.** Live Representatives Wanted. Exclusive Territory.

WHITE FLAME LIGHT CO., 48 Clark Bldg., Grand Rapids, Mich.



Sunshine Lamp 300 Candle Power FREE!

To Try in Your Own Home Turns night into day. Gives better light than gas, electricity or 13 ordinary lamps at one tenth the cost. For Homes, Stores, Halls, Churches. A child can carry it. Makes its own light from common gasoline. Absolutely SAFE.

COSTS 1 CENT A NIGHT

We want one person in each locality to whom we can refer new customers. Take advantage of our SPECIAL FREE TRIAL OFFER. Agents Wanted.

SUNSHINE SAFETY LAMP CO.
220 Factory Bldg. Kansas City, Mo.



that were in the middle of the tub are moved to the outside. The difficulty lies in judging when the eggs are about ready to hatch. If the chickens should hatch out down in the mass of rice they are liable to smother, and so the breeder has to be very careful when the hatching time draws near. Nevertheless, this method in the hands of the natives, is said to yield a large percentage of live chickens.

SAFETY FIRST

Yale Electric Lantern

and Combination House Lamp, Search and Flash Light. This is NOT a Toy. Turn a switch and you get a flood of light! The safest, handiest, most simple illuminated light for automobiles, railroads, apartments, marinas, farms, etc. Kerosene, kerosene, matches, oil, grease, smoky chimney, trimming of wires and other trouble. **Never again will you need.** Introductory Price \$3.50. A sample will be sent by prepaid parcel post on receipt of remittance of introductory price. Order sample and agency proposition now—the first. Sold on money-back guarantee. A big money-maker for agents. Agents Wanted Everywhere. **YALE MANUFACTURING CO., 28-22 So. Clinton St., Chicago**



IF IT ISN'T AN EASTMAN IT ISN'T A KODAK



BEACON BURNER

Fits Your Old Lamp. 100 Candle Power. Incandescent Pure white light from kerosene (coal oil). Hotter, brighter, safer, cheaper than gas or electricity. Best light for homes, stores, halls, churches. Recognized as standard kerosene lamp of the world. 500,000 satisfied users.

Costs Only 1 Cent for 6 Hours We want one person in each locality to whom we can refer new customers. Take advantage of our special offer to secure a Beacon Burner Free.

WRITE TODAY. AGENTS WANTED. HOME SUPPLY CO., 111 Home Bldg., Kansas City, Mo.

FREE!

What does the New Year mean to YOU?



Is it to be the same old grind of hard work, uncongenial employment and small pay?

Is it to be another twelve months of standing still while you watch other men get the advancement you hoped to get?

Or, will you make it a year of real achievement? Will you realize **now** that the better job goes only to the man who has the **training**, and will you take steps **now** to get the training that the better job requires?

If you really WANT the coming year to count for something, let the International Correspondence Schools help you to make your progress SURE and TANGIBLE.

It is the business of the I. C. S. to raise salaries. For 24 years the I. C. S. have been training men for success in the kind of work they like best. During this period, many thousands of earnest, ambitious men of all ages and occupations have obtained better-paying positions in more congenial surroundings through a course of I. C. S. instruction.

Let the I. C. S. help you, too. Join the army of well-paid men.

Mark the Coupon

The coming year is the most important in your life. Get a real start **now**. The first essential to success is initiative. Mark and mail the coupon **today**.

INTERNATIONAL CORRESPONDENCE SCHOOLS

Box 872-J, Scranton, Pa.

Please explain, without further obligation on my part, how I can qualify for a larger salary and advancement in the position, trade, or profession before which I have marked X.

Electrical Engineering
Electric Lighting
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Name _____

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Please Mention Popular Mechanics



Cold?

THE warmth and easy fit of Hansen's Gloves keep your hands cosy and blood circulating, and the strong horsehide protects perfectly.

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With or Without Lining

These gloves and mittens have plenty of style, with fit and the soft smoothness of the outseam.

Write for Free Glove Book

Describes many of the 500 styles — mittens too — for every occupation. All giving most value for least cost. Get Hansen's Gloves from your dealer. If he is not supplied, write us. Anyway, write for book.

O. C. Hansen Mfg. Co.
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AETNA ACCUMULATIVE ACCIDENT POLICIES pay \$50 a week if you are disabled. An high as \$10,000 for death. Write for particulars.

Drawer 1241

AETNA LIFE INSURANCE COMPANY

Dept. PM. 1-15

Hartford, Conn.

I Am Making a Special Factory Price on 10,000 Rapid Fireless Cookers



Big bargain to introduce cooker into new neighborhoods quick. Write before price advances.

30 Days' FREE TRIAL

Cooker is aluminum lined, of course. Complete outfit aluminum utensils free. Write for Free Book with 150 recipes and Bargain Prices direct from factory.

WM. CAMPBELL CO., Dept. B4, Detroit, Mich.

PATENTS

If you have an invention which you wish to patent you can write fully and freely to Munn & Co. for advice in regard to the best way of obtaining protection. Please send sketches or a model of your invention and a description of the device, explaining its operation.

All communications are strictly confidential. Our vast practice, extending over a period of nearly seventy years, enables us in many cases to advise in regard to patentability without any expense to the client. Our Hand-Book on Patents is sent free on request. This explains our methods, terms, etc., in regard to **Patents, Trade Marks, Foreign Patents, etc.**

All patents secured through us are described without cost to the patentee in the **SCIENTIFIC AMERICAN**.

MUNN & COMPANY
SOLICITORS OF PATENTS

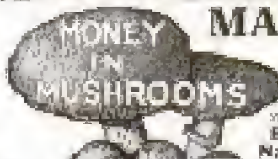
359 BROADWAY, NEW YORK
and 625 F STREET, WASHINGTON, D. C.

In the fiscal year, ended June 30, 1914, a total of 63,784,713 lb. of cheese was imported into this country. The U. S. Department of Agriculture urges American cheese makers to take advantage of the present disturbance in international commerce to establish a reputation for their products that will outlive the war.



Print Your Own

Cards, circulars, menus, newspaper, book, etc. **THE PRESS** Co., larger \$18. Rotary \$60. Silver money. Big money printing for others. All easy, rules sent. Write factory for illustrated press catalog, TYPE, cards, paper, samples, etc. **THE PRESS CO., Meriden, Conn.**



MAKE BIG INCOME

Men and Women grow mushrooms all the year at home in cellars, stables, sheds, boxes, etc. Sell as high as \$1.00 a lb. Great demand, markets waiting. Start Now. Big Booklet telling how to do it Free. **Nat'l Spaw Co., Box 12, Boston, Mass.**

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Furniture, Carpets, Rugs, Etc.

Easiest Terms Hartman's credit terms easiest, most liberal ever offered. No security—no notes—no mortgage. Free from all objections. At the end of a month you may return anything unsatisfactory.

FREE—Big Bargain Book Over 3,000 bargains. Write today for FREE copy.

HARTMAN FURNITURE AND CARPET CO.,
3945-47 Wentworth Ave., Chicago



Flash Like Genuine DIAMONDS

at 1/50 the cost—in SOLID GOLD SETTINGS

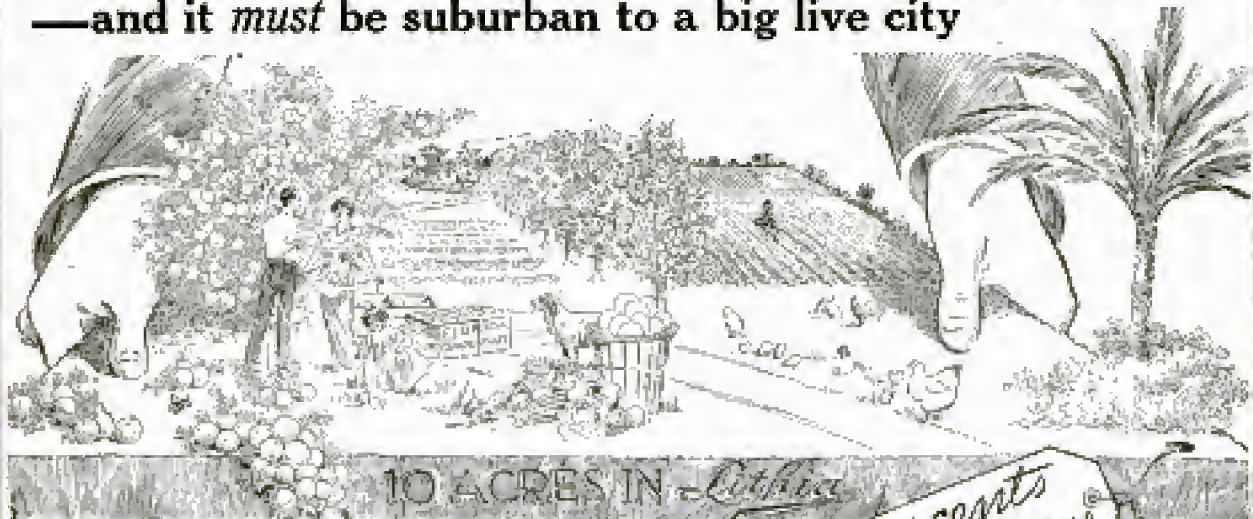
See Them Before You Buy

It is the stone nearest a diamond at a price which saves you money. An actually valued stone with lasting fire and brilliancy. You must see it to appreciate it, as thousands of buyers have since 1905. Costs nothing to see. **WRITE FOR CATALOG TODAY.**

BARODA CO., DEPT. 15, 1480 Leland Ave., Chicago

The Farm YOU Want

is compact, easy to pay for, and enormously productive
—and it *must* be suburban to a big live city



Here it is—and it's yours for

**3 1/3 cents
per day per acre**

IN OUR NEW LITHIA TRACT SUBURBAN TO TAMPA, the metropolis of South Florida. It is one of the few choice suburban farm tracts left in Hillsboro County, the recognized center of Florida's grape fruit and orange belt.

This is the third great Hillsboro County tract that has been opened to homebuilders and investors by our old established, responsible, thoroughly experienced organization. Over 2,500 families are now rejoicing because they bought at opening prices in our two former tracts. Every family can tell you they got a square and generous deal.

Our new Lithia Tract now offers you the same wonderful opportunity—and more, because of the rapid growth and development on all sides within the past four years.

The visible supply of select Hillsboro County grape fruit land is melting away very fast. Prosperous homes are scattered around the Lithia Tract—grape fruit and orange groves are flourishing on all sides. Already buyers are building homes on our new Lithia Tract, and values are due to rise here just as they have in our two former suburban farm tracts in this same county.

Free—Absolutely Free—100 grape fruit and orange trees to each and every purchaser who reserves one of these farms before Feb. 1st, 1915. These trees will be held in our Nurseries until you are ready to plant them. This will give you a splendid start in developing a grove which will bring you an ever increasing income and greatly increase the value of your entire farm. Mail the coupon today.

One judicious investment, remember, means more to your bank account than years and years of labor. Honestly, now, what have you to show for that little 3 1/3 cents per acre per day that might just as well be buying you a beautiful 10-

Get our big new Florida book and look at the map—read the many enthusiastic testimonial letters from settlers now living on the farms they bought from us. Four big railroads intersect these suburban tracts—all the comforts of modern life right at hand! The completion of the Panama Canal throws the spotlight on Tampa, the nearest deep water port, and the traffic of the whole maritime world will pass at Tampa's door.

Think of it—a 10-acre farm suburban to a city like this—a farm big enough to keep you in comfort all your lives, yet one you can pay for at the rate of just 3 1/3 cents per acre per day!

Get the facts now. The coupon brings them to you without cost or obligation. Get your 1915 opportunity clearly before you while prices on this newly opened tract are still low and terms easy. Today \$1.00 per acre per month buys you independence and a future. Tomorrow—who can say?

Tear off the coupon and mail it now and we will lay before you, by return mail, full and complete information showing how you can easily become the owner of one of these beautiful grape fruit and orange groves, and why it is sure to prove the swiftest, most profitable investment you can possibly make.

North Tampa Land Co.

C. E. THOMAS, President
837 Marquette Building CHICAGO

acre farm? Where else could you put aside a few odd dollars so safely, so securely, and with such certainty of seeing your modest savings fund develop into a great big investment?

No use trying to make yourself believe that savings bank interest will ever make you independent, nor 4% loans make you rich. Your money isn't working when you tie it up in such ways—it's LOAFING. Make your money work for YOU! Right here in these rich fruit lands is your opportunity—here where a few dollars put to work NOW will reap all the benefits of development work constantly being done by the fast increasing population.

If you do not wish to improve your farm, you can in a few years, cash in on it from the investment standpoint without a stroke of work on your part. Think of it—two or three cigars a day, or the cost of a few car fares laid by—and a magnificent grape fruit and orange grove is the result almost before you know it!

You can pay for your land by work. We will sell you ten or more acres and make a contract with you giving you employment clearing land. We will give you enough work to entirely pay for any number of acres you want. All you need is a willingness to work and enough money to pay your fare to Tampa. As clearing is hard work, we can only make such contracts with those who are physically able to do this kind of work. Such an unparalleled offer to obtain a choice farm has never before been made. Write for full information regarding this special employment contract.

North Tampa Land Co., Pop. Mech. 1-15
837 Marquette Building, Chicago

Please send me, FREE, assortment blank for 100 grape fruit and orange trees, and your latest illustrated book on choice Citrus Fruit and Truck Farms suburban to Tampa, Florida.

Name

Street No.

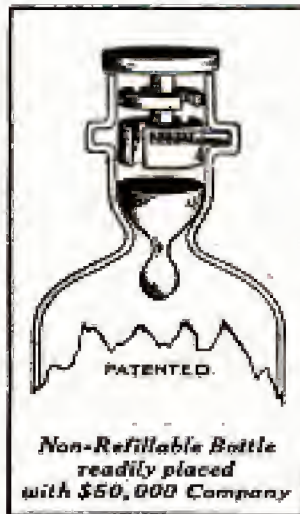
City

Manufacturers Calling for Over Two Hundred Inventions

Money Is Waiting to Back the Good Idea

(By a Washington Patent Attorney)

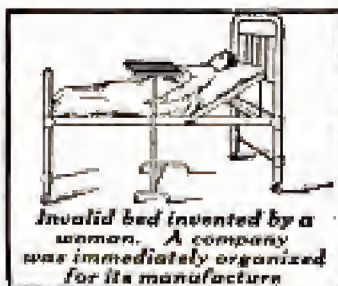
Never was there so good an opportunity for the inventor of something—*anything*—of merit as right now.



Manufacturers with money and facilities are asking for ideas—*calling* for them. The supply is not nearly equal to demand. Over 200 inventions are asked for in a list just given in a little book "What to Invent." The demand is not for anything extraordinary—just the common everyday things that make work easier or life more pleasant in the household, the shop or the field.

You might think the possibilities of the window screen had been exhausted, but I know of 28 concerns that are looking for a new screen, duly covered by patent, which they can manufacture. I know of 46 manufacturers and others who are ready to manufacture any good, patented household article such as can openers, baking pans, coffee pots, washing machines carpet sweepers and other devices.

Within the last few weeks I have received forty special requests for a dishwasher and drainer; seventeen others request an improvement in scissors. Manufacturers know that everyone must have a pair of scissors in the house, and they realize that a novelty in them would always sell in place of the old kind, and hence the demand. Among my letters are sixteen requests for a device to turn sheet music on a music stand or piano, and seventeen people are interested in the purchase of a patent



on a device for holding an electric light in any position. Besides these there are hundreds of manufacturers who do not specify any particular device but state that they would be interested in anything of merit

A Chicago man says: "I want something that can be sold to farmers by mail. There is practically no limit to the investment my associates would make in a good proposition." A man in Woodhaven, N.Y., says he is in the market for a small household article, light in weight, which can be sold somewhere around ten cents.

A prominent manufacturing company is interested in something to sell to hardware stores, but would also be interested in other things promising to be money-makers.

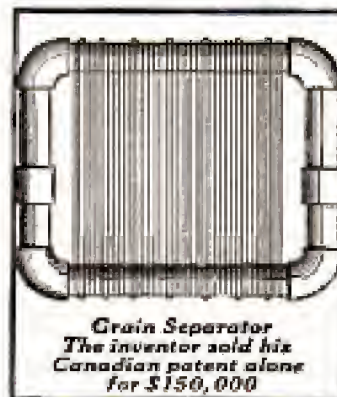
A man in Revere, Mass., says: "I am looking for something that can be manufactured, plant equipped, etc., and marketed for an outlay of not over twenty-five thousand dollars."

A big textile machinery company says they are interested in newly patented devices that can be

either bought outright or manufactured on royalty. They do not require machinery inventions alone, but anything of merit.

A company in Belvidere, Illinois, wants patents on small tools or metal novelties.

A Dayton, Ohio, concern writes for some machine or device that would have a general sale throughout the land.



The names and addresses of these prospective purchasers are supplied absolutely without charge by Messrs. Chandler & Chandler to those who obtain patents through their firm. This firm has been in practice before the Patent Office for over twenty years, and its members are, consequently, familiar with every detail of patent work. They also issue a booklet entitled "How to Obtain a Patent," which tells in simple words just how to go about protecting an invention. The two books, "What to Invent" and "How to Obtain a Patent," are both free. Why don't you write for them and learn what manufacturers are looking for and how to protect your ideas? If you have an invention, send a sketch or model and description of it to Chandler & Chandler, 953 F Street, Washington, D.C. They will give you a free opinion as to whether or not it can be patented.

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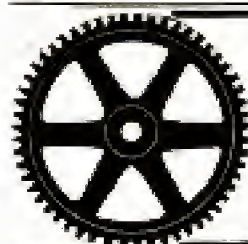
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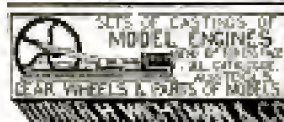


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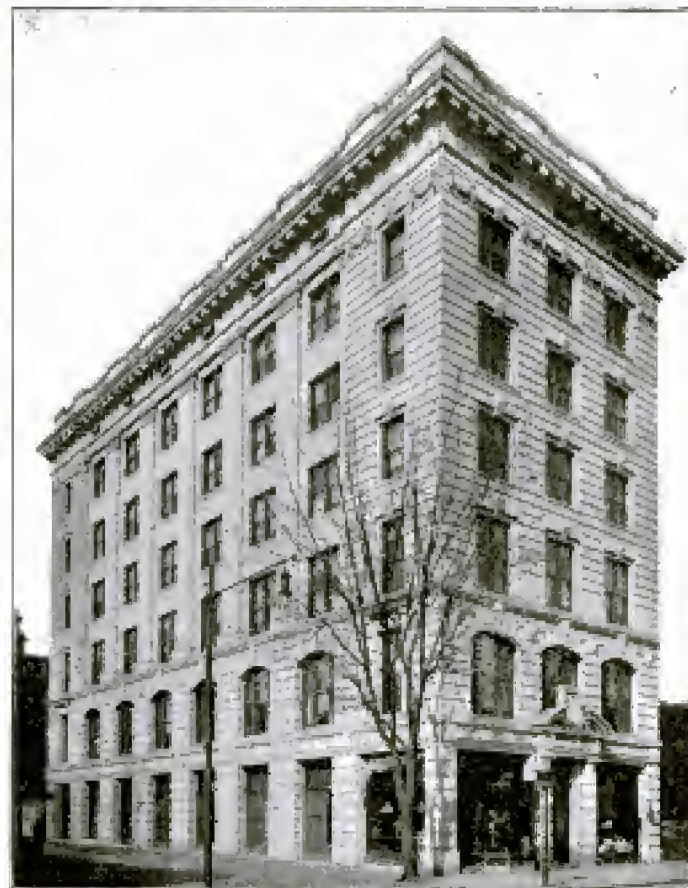
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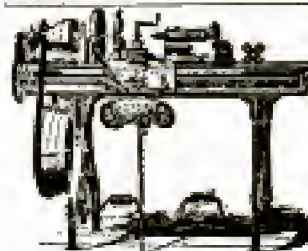
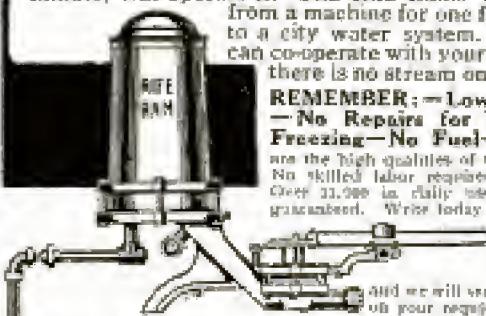
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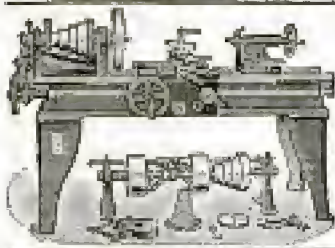


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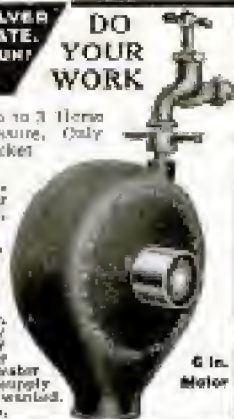
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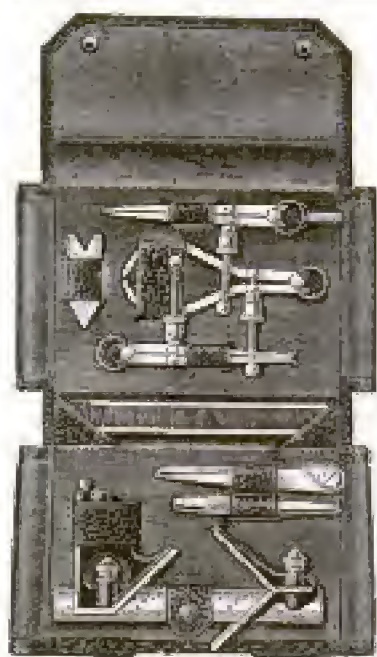
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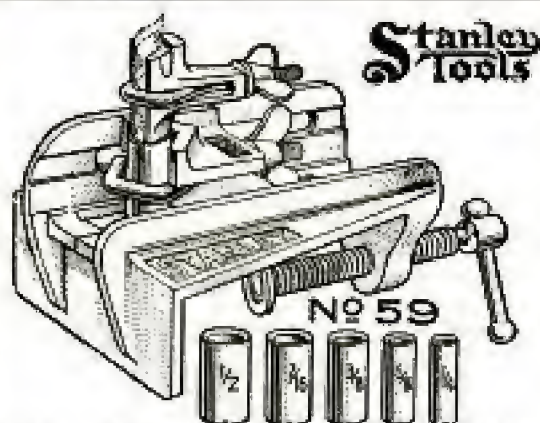
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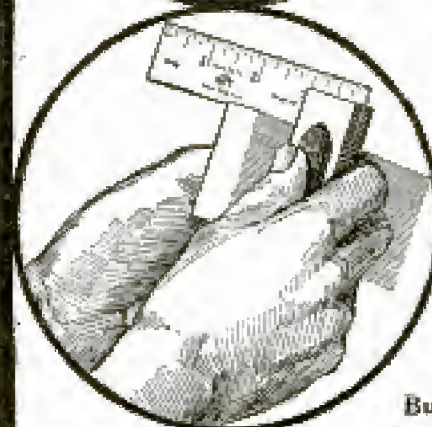
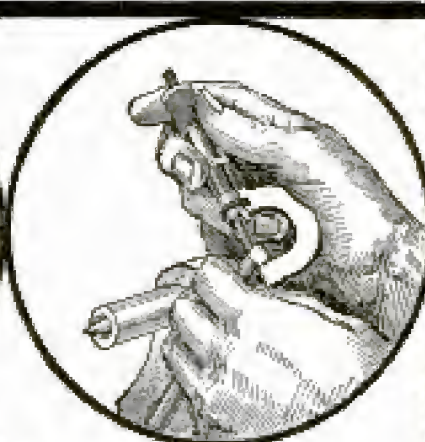
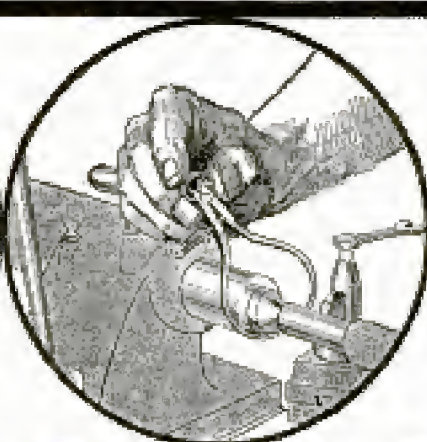
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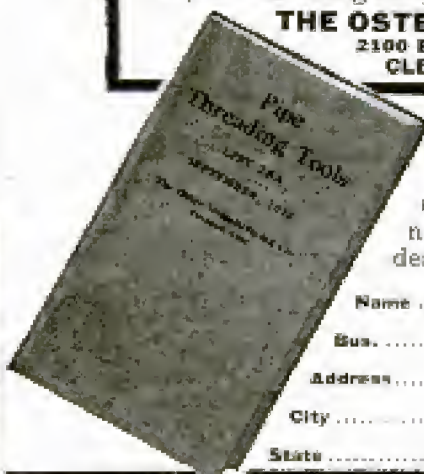


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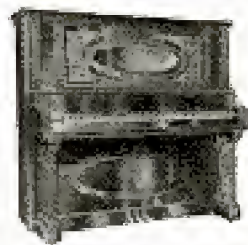


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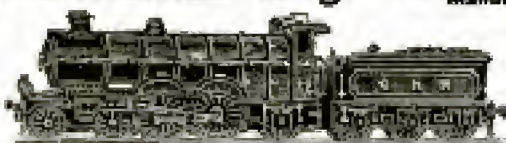
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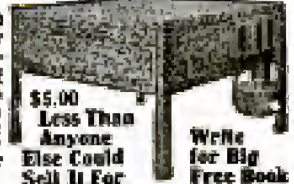


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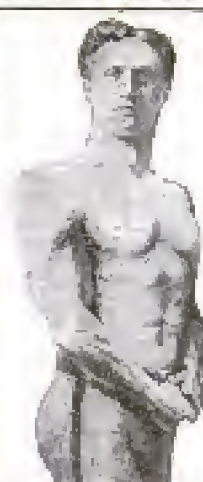
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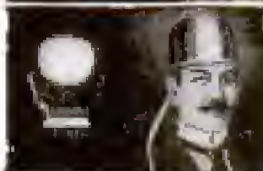
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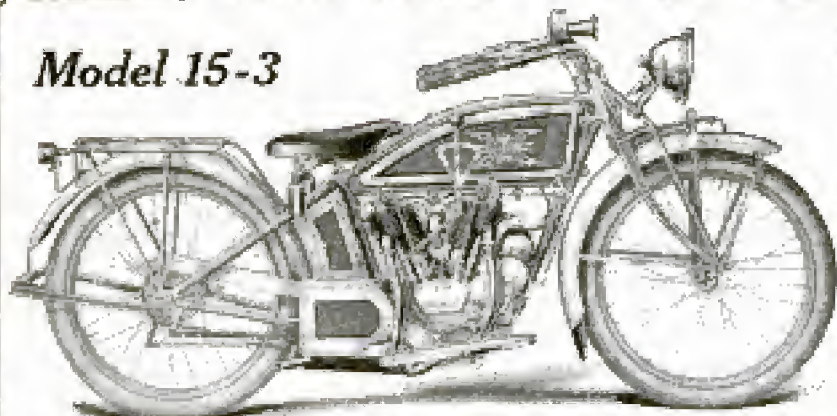
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Be first to enter this new big paying business in your town. Open your pockets. Let the dollars pour in. Act quick. Automobile business growing fastest. Each Auto Sold Means More Tires to Mend. Enormous field for tire repairing. Punctures and blowouts are common. Tires need retreading and vulcanizing. Something going wrong all the time. Thousands forced to buy new tires because they can't get old ones fixed. Think of the old bicycle days—repair shops on every corner—all making money—day and night. Autos make same proposition over again—only ten times bigger and better. Tires of Hayward Tire Repair Plants are making big money. Johnson, Tex., writes, "I made as high as \$18 profit in a day." Another man who bought a plant September, 1911, writes he has cleared over \$3,000.00. Be the first to start. Experience unnecessary. You learn quick. Simply follow directions. Business comes fast and easy.

This
Hunch
of Tires
Will
Make
Several
Dollars
Profit



Put
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self
Where
This
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Is.

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Young men—repair father's tires—get the money he pays garage man. Get the neighbors' work. Auto owners—repair your own tires—auto money—have outfit for home use. Anyhow investigate. Send today for catalogue explaining wonderful money making possibilities in this field.

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Rider Agents Wanted

in each town to ride and show a new 1915 model "RANGER" bicycle. Write for our liberal terms.

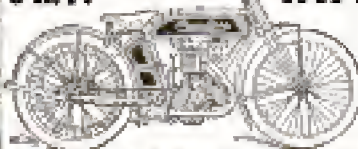
DELIVERED FREE on approval and 30 days' trial. Send for big free catalog and particulars of most marvelous offer ever made on a bicycle. You will be astonished at our low prices and remarkable terms.

FACTORY CLEARING SALE—a limited number of old models of various makes, \$7 to \$12. A few good second-hand wheels \$3 to \$5. Write if you want a bargain. Tires, lamps, wheels, handlebars, parts, motorcycle supplies of all kinds at half usual prices. Write us before buying.

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5 H. P.

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with Free Engine, Bosch Magneto, together with the best there is in motorcycle construction. Power, Speed, Silence, Endurance, and those working qualities so essential for low cost of maintenance.

5 MILES PER ONE CENT

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Fun and Health

FOR boys and girls from 5 to 15 years of age. Wonderful new mechanical principle. Speed without labor. Rider propelled by his own weight. No pushing. See it. You can't realize the fun and health in this marvelous little car from a picture. Send for a



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It develops the lungs, shoulders and legs. Children never tire of it. Ball bearing, unbreakable steel frame. It will stand the knocks. Write for free circular and our special trial offer.

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SKUDDER CO.

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MAKE YOUR BIKE A MOTORCYCLE



at a small cost, by using our attachable outfit. Fits any Bicycle. Easily attached. No special tools required.

8 Months' Repairs, 30c

Mr. Graham, of Texas, writes: "I want to write a few lines to you telling you how well pleased I am. Any man or boy can make a good motorcycle with that little \$25.00 motor. It is the simplest and best motor a man can buy for a little money. I ran mine eight months without repairs, and then it cost only 30 cents. It uses only half the fuel that other machines use. I can go anywhere with the little SHAW that any other car."

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Toughest, thickest, most resilient tread. Built like a motor-car tire. All sizes: Non-Skid and corrugated tread.

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The Electric-ally Equipped *Indian Motorcycle*
With Cradle-Spring Frame. Send for Free Catalog.
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Members of the new club commenced work in June, 1914. Many of those who prepared the seed bed thoroughly, planted their peanuts at the proper time, and gave them good cultivation, secured a good stand and a good harvest.

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A LATH and plaster job can't be hurried. It takes weeks for plaster to dry. And the walls are damp and cold—not airtight. The ideal substitute for lath and plaster is

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The Only 5-Ply Wall Board

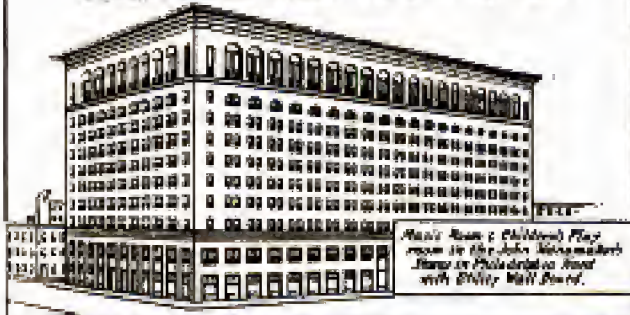
Five layers of tough fibre board give that much more strength than the usual 2 or 3 layers. Utility is nailed direct to studding and joists and tinted with kalsomine or any flat tone paint.

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Washes everything from blankets to fine laces. Tub of clothes washed in 5 to 10 minutes. A child can operate it.

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\$2.00



- — at a touch of your thumb. A little electric lighting plant in itself. Entirely
- out of the pocket flasher class. No smoke, no heat,
- no oil can to fill and spill, no cleaning, absolutely safe anywhere. Wind and rain proof.

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\$5 DURHAM-DUPLEX Domino Razor for \$1

Give your Durham-Demonstrator Razor to a friend and we will send you this \$5 Durham-Duplex Domino Razor for \$1.

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Conditions—Send me a \$5.00 Durham-Duplex Domino Kit Outfit as per illustration above for which find enclosed \$1.00

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BURROWES

Billiard and Pool Table

No special room is needed. The Burrowes Table can be set on your dining-room or library table, or mounted on its own legs or folding stand, and quickly set aside when not in use. Burrowes Tables are splendidly made and correct in every detail. The most expert shots, calling for skill of the highest order, can be executed with the utmost precision. Some of the leading professionals use Burrowes Tables for home practice. Sizes range up to 4½ x 9 ft. [standard].

The Cost is Trifling

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Please send catalog of Billiard Table offers.

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FREE TRIAL— NO RED TAPE

On receipt of first installment we will ship Table. Play on it one week. If unsatisfactory return it, and on its receipt we will refund your deposit. This insures you a free trial. Write today or mail the attached coupon.

Insist on Burrowes Rustless Insect Screens and Folding Card-Tables



**\$100
DOWN**

Terms are very easy — \$1 or more down (depending upon size and style selected), and a small amount each month. Prices from \$15 up. Cons. BULLS, BRO., FRANK.



Jones Machine Moulded
**PULLEYS
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Clutches, Sprockets
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THE LARGEST LINE OF
Power Transmitting Appliances
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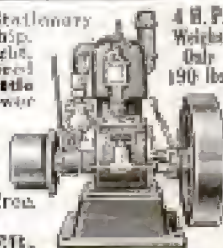
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Cushman Light Weight Engines

Represent a great advance over ordinary Stationary Engines in design, material and workmanship. Highly efficient because of light weight, higher speed, reduced friction and lowered operating cost. 4 Cycle, 4 to 20 H. P. **Throttle Governor** insures fuel consumption and power in proportion to load. Ideal for **electric lighting plants** and other uses where very steady power is required. Equipped with **Schubler Carburetor** and **Friction Clutch Pulley**. Not a cheap engine, but cheap in the long run. Engine Book free.

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Lower picture shows the famous Bessemer Fuel Oil Engine. Widely used in irrigation, pump mills, factories, electric light plants, etc. Runs on cheap fuel and crude oils. No batteries or magnets required; ignition is automatic after starting. 15 to 100 H. P. Special Catalog "G" free.

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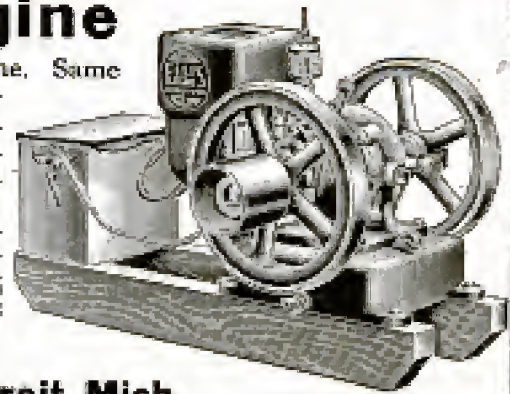
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Here's the biggest engine value ever offered in a 1½ H. P. engine. Same cylinder capacity as many 2½ H. P. engines. Throttling governor adjustable while running; crankshaft extends on both sides. Runs either way. Starts without cranking. Equipped with Ellis Patent Fuel Device, guaranteeing successful operation on cheap oils. Beautifully finished in genuine engine enamel.

Runs on 9c a Day

Just the engine for pumping, separating, churning, corn-shelling, sawing, shop work, electric lighting and dozens of other light jobs. Sold on 30 days' trial. Guaranteed for 10 years. We make other sizes from 3 to 18 H. P., vertical and horizontal, single and double cylinders. Ask for our free book, "ENGINE FACTS," telling how to judge and buy an engine.

ELLIS ENGINE CO., 2873 E. Grand Blvd., Detroit, Mich.



More Power 6H \$9875 Less Money 6P



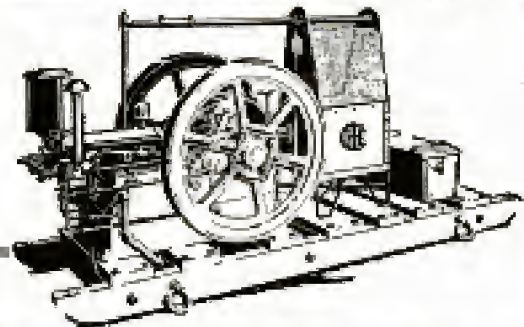
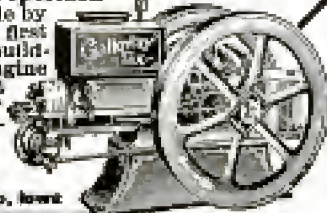
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is the greatest offer ever made by any manufacturer and is the first time in the history of engine building that an A 1 high-grade engine of this h. p. could be bought for so low a price. Write for particulars and price-reducing sliding scale schedule.

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Titan engines are sold by local dealers only. Write for a catalogue, showing an interesting array of special features, and we will tell you where you can see the engine.

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16 Harvester Building

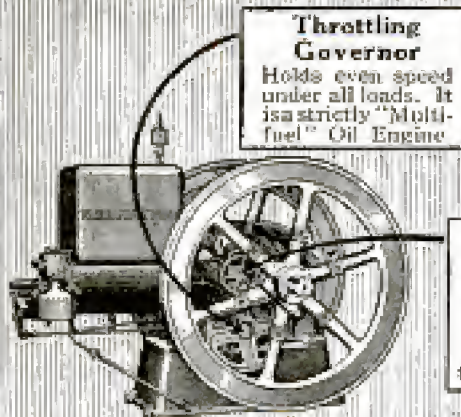
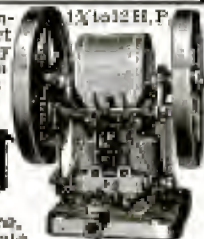
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Even Gasoline, Kerosene or Distillate—have double the power of other engines of equal weight—are easiest to move—easy to get at—take up least space—run smoothest—start easy—burn less fuel and last longer. Free Catalog Folder gives 18 reasons for U. S. superiority and quotes low easy-to-pay factory prices. Write now.

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Holds even speed under all loads. It is strictly "Multi-fuel" Oil Engine.

Built-in Magneto eliminates ignition trouble—saves battery expense.

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the cheapest oils for operating your engine? If so our "Multi-fuel" Oil Engine turns the trick.

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He Sold It
At a Profit
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**\$25
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Save money by using a **VIM** 1/2 H.P. Engine Motor for churning, washing, pumping, separating, straining, etc. Works operate easily. No valves, cams, gears or complicated parts. Water Cooled, automatic positive lubrication, sensitive governor. Weighs only 25 lbs. Comes ready to run. Fully guaranteed. Get catalog and special agency offer. **THE VIM MOTOR CO., 801 Water St., Sandusky, Ohio**

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Makes nights in camp cheerful—can overhaul guns and tackle or read. Worn on cap or belt. Both hands free for gun or knife. Casts bright circle on trail, and prevents stumbling. Great for coon or possum.



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A fine lure for fish or frogs. Ideal for casting, jigging, spearing, hunting or canoeing. Handy for repairing tire punctures at night. Projects light of over 14 candle power 150 ft. Burns acetylene gas. Weight 5 oz. Height 3 1/2 in. No oil, wick or glass. Absolutely safe and simple. Lamps equipped with or without spark lighters. Catalog free and instructive booklet, "Knots and How to Tie Them," mailed on request.

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3 H.P. \$55

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Toledo MARINE MOTORS

"Nothing Cheap but the Price"

3 H. P. 1 cyl. complete	\$ 65.00
6 H. P. 1 " "	84.00
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The Evinrude Detachable Rowboat Motor makes any rowboat a motorboat in less than one minute. 1914 models equipped with built-in Reversible Magneto, Maxin Silencer, Compensating Device, Shock Absorbing Device and other exclusive features. Illustrated catalog sent free upon request.

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\$29.95**

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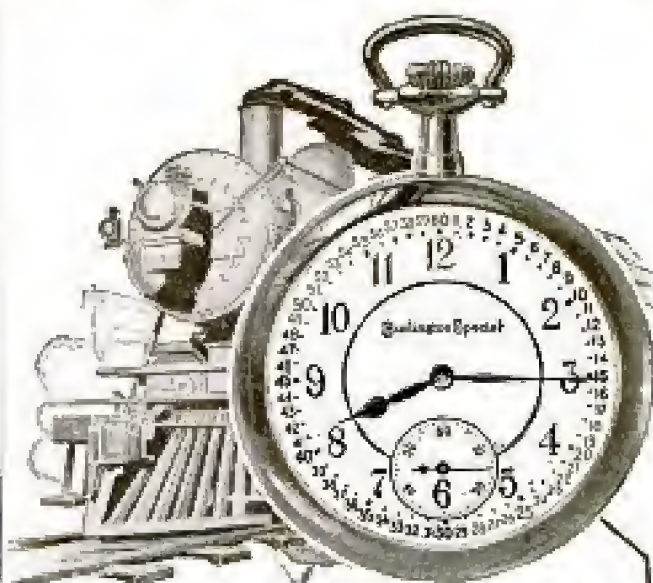
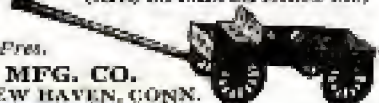
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(The Toy with Bridges Like Structural Steel)



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The *Burlington*—the masterpiece of watch manufacture—19 jewels—yes, 19 full sapphire imported jewels—adjusted to temperature, adjusted to positions, adjusted to isochronism—this superb watch, acknowledged by experts to be the greatest watch ever manufactured—will now be shipped to you direct at the rock-bottom price—the rock-bottom price direct from us—the same price that even the wholesale jeweler must pay.

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New, wonderful sensation. No experience necessary to operate the "Mandel-ette"

A One Minute Camera that takes and finishes pictures in 1 minute

No Plates—No Films—No Dark Room

The "Mandel-ette" weighs 21 ounces. Embodies camera, developing chamber and darkroom. Special lens with universal focus. Perfect working shutter. Cartridge 3 1/2 x 3 1/2 inch post cards. Loads in daylight. Breeching simple—a child can operate it.

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Aerically 111-111 GRADE Motor that will give CONSTANT and EFFICIENT service. Especially adapted for CROCKERY LIGHTS. Aluminum base, copper water jacket, steel shaft, bronze bearings.

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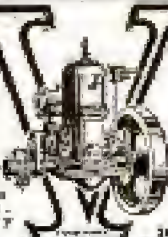
1131 MONROE AVE., GRAND RAPIDS, MICH.



VIM

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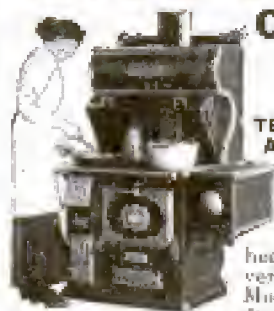


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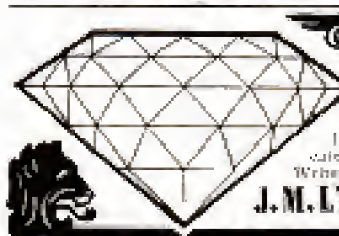
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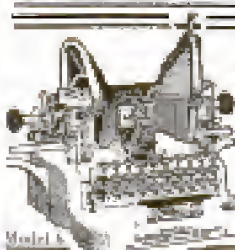
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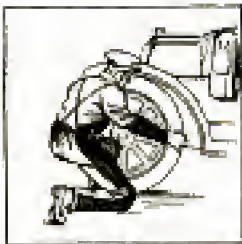
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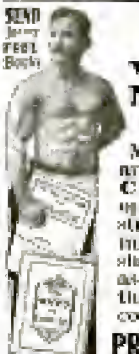
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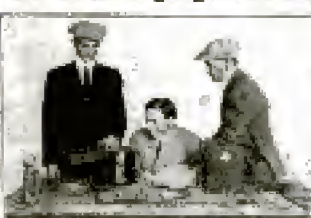
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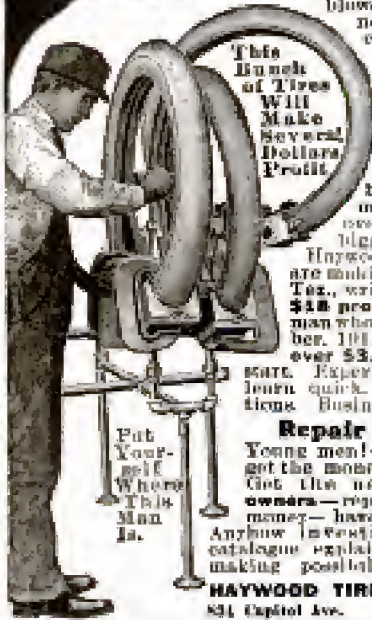


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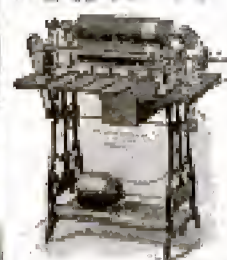


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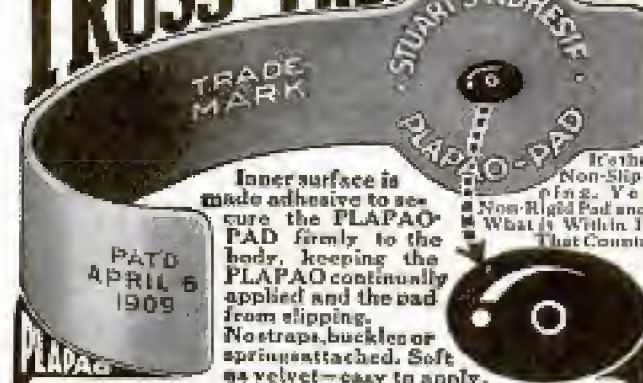
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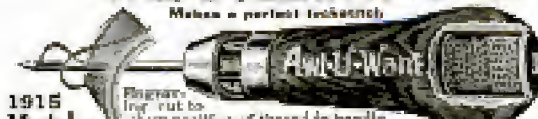
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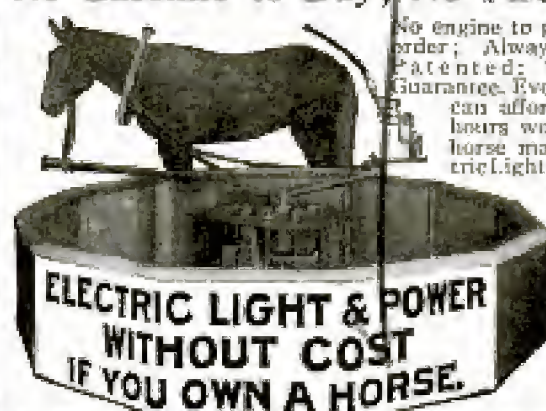
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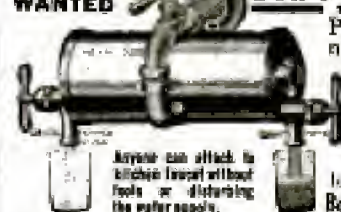
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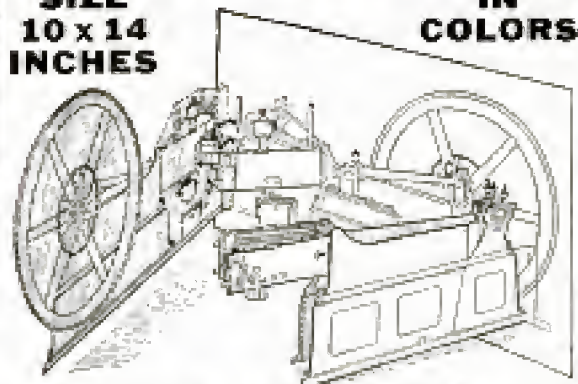
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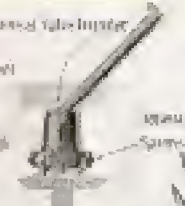
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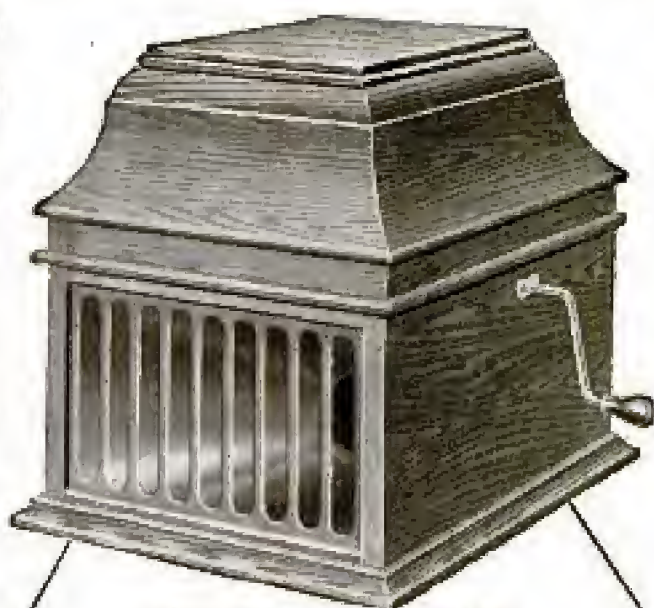
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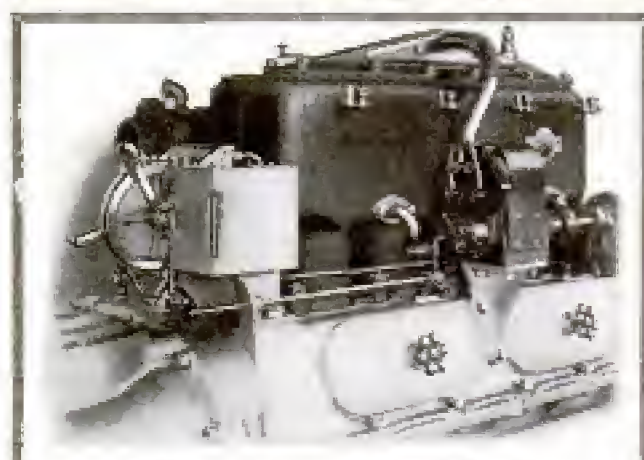
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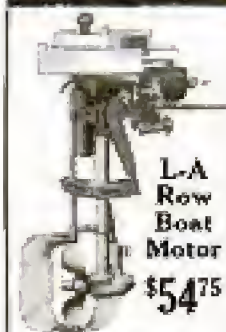
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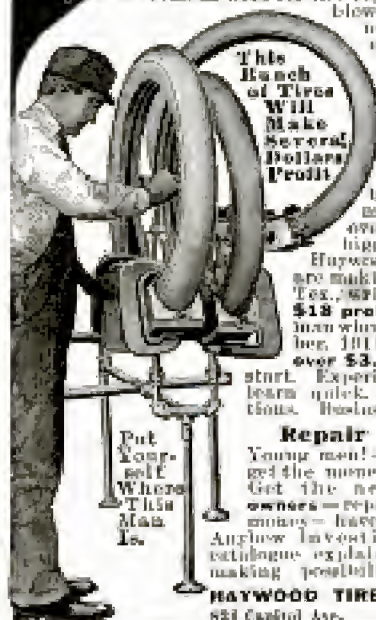
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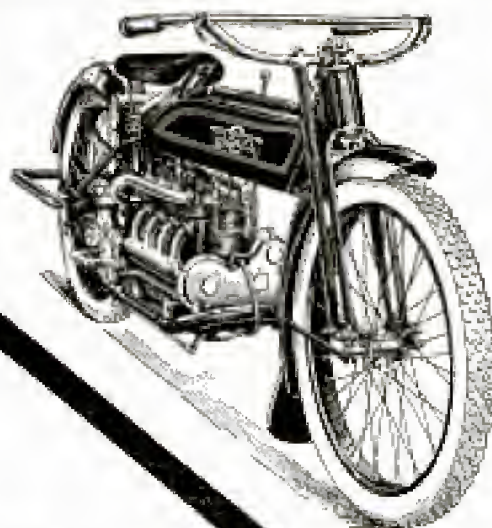
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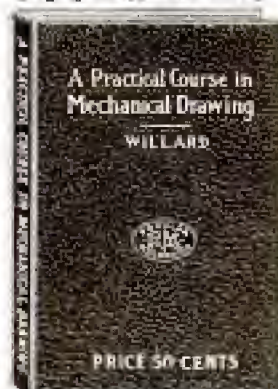
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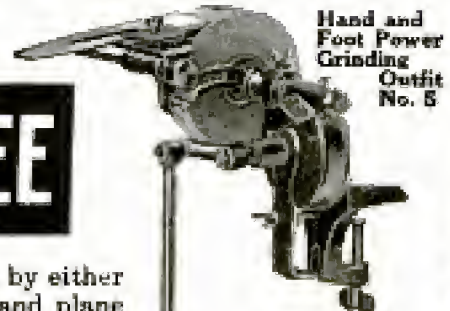
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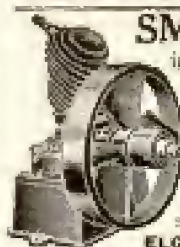
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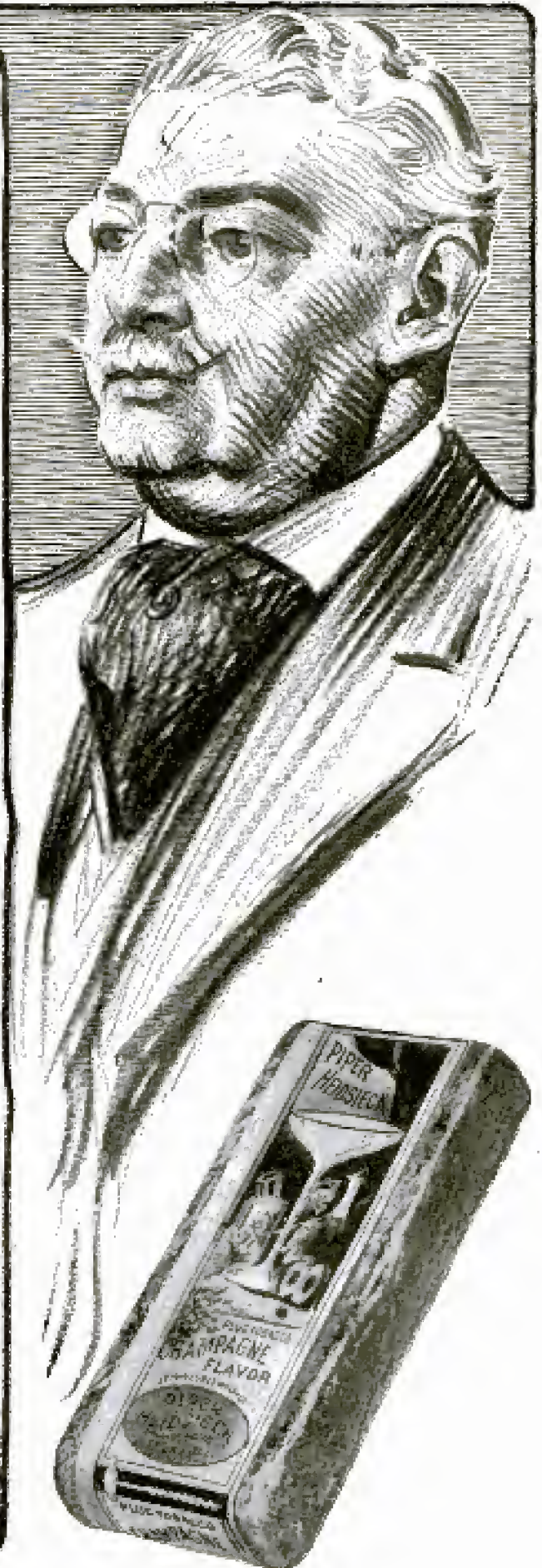
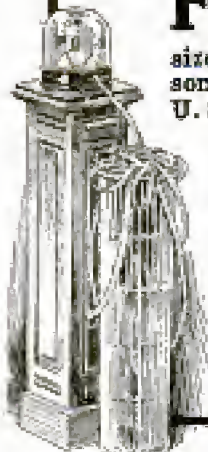
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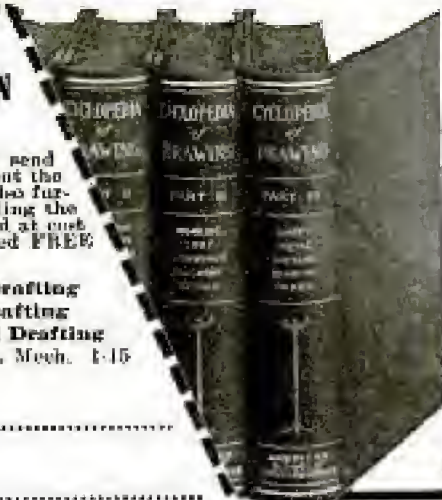
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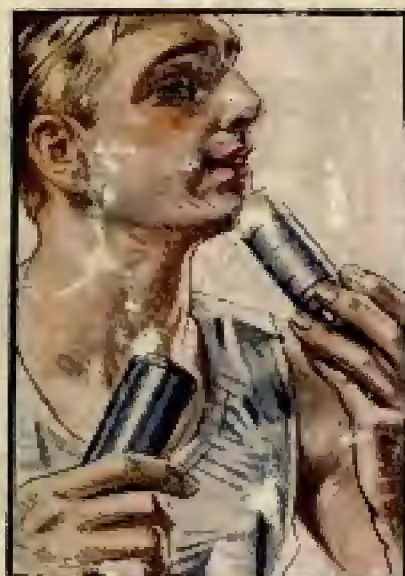


FIRST

To withdraw the stick from its container, rub a little soap on the face and return the stick to its case takes only an instant. To work up a big, copious, creamy lather takes but a moment more.



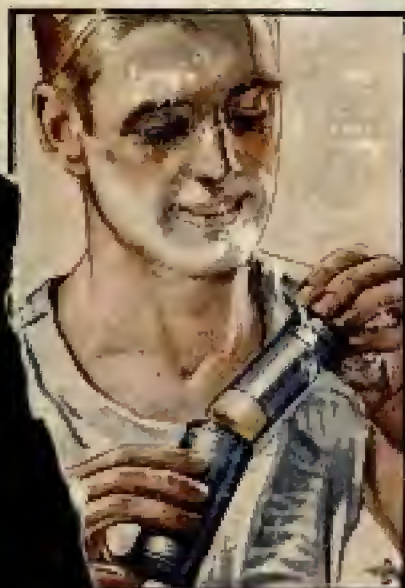
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